Water Quality Trading Business Case for Montana

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1.0 EXECUTIVE SUMMARY

The Project Team of Morrison-Maierle (Helena, MT), Kieser & Associates, LLC (Kalamazoo, MI), and M J Walsh & Associates, Inc. (Downers Grove, IL) was retained by the State of Montana Department of Environmental Quality (MDEQ) to develop a "business case" for Water Quality Trading (WQT) in Montana. The purpose of the business case was to assess viable market program structures to support nutrient trading in Montana in conformance with ARM 17.30.1701, incorporating by reference, Montana's Policy for Nutrient Trading (CIRCULAR DEQ-13). The premise of this study was that wastewater treatment plants (WWTPs) will face treatment upgrade costs over the next 20 years to meet expected effluent limits for Total Nitrogen (TN) and Total Phosphorus (TP) in response to Montana's new nutrient standards. Use of trading to cost-effectively meet future permit limits for TN and TP would be afforded through implementation of land-based conservation practices in agriculture and forestry to generate nonpoint source (NPS) nutrient credits. Thus, the business case for trading examined whether trading could provide such a cost-effective compliance alternative. In turn, based on the projected trading volume and potential cost-savings with trading, the business case would identify options and costs for a one-time-only MDEQ investment for developing and launching a WQT program framework under the existing trading policy.

This report presents the results of these business case analyses by documenting methods, findings and conclusions of the Project Team's efforts to identify future MDEQ investment options in WQT. Key elements of the report include sections on WQT demand, trading credit supply, comparisons of credit demand and supply as well as costs, and the resulting business case recommendations. This Executive Summary highlights methods and findings of the overall analysis.

1.1 WWTP Demand

For assessment of potential demand for WQT credits, the Project Team examined trading opportunities in the context of spatial and temporal scales for municipal and industrial WWTPs in Montana. The assessment of trading demand focused on the largest WWTPs and other facilities with mechanical treatment technology. Through discussions with MDEQ, demand was represented by difference in current WWTP loads and future loads under nutrient standards. These loads were derived from MDEQ's DEPARTMENT CIRCULAR DEQ-12A (Montana Base Numeric Nutrient Standards) and DEPARTMENT CIRCULAR DEQ-12B (Nutrient Standards Variances). If current treatment technology and built infrastructure was capable of meeting anticipated future effluent limits reflecting the new instream standards, the facility was not considered as a potential buyer of NPS nutrient credits. Otherwise, PSs likely requiring some form of facility upgrade were targeted for the demand assessment.

The final list of dischargers with potential trading demand identified 27 major and minor point sources that should likely consider trading to meet seasonal (July to September) nutrient limitations. WWTP nutrient demand was calculated for each discharge permit over four discharge cycles (20 years). Nutrient removal demand for each treatment plant was based on historical performance (or expected performance if an upgrade is in process) compared to the variance limits in the regulations. A flow increase was assumed for each treatment plant at 2 percent for each permit cycle. This equated to approximately 0.5 percent growth per year.

Upgrade costs for all of the WWTPs were ultimately based on relevant literature values[1]. Such data were used by MDEQ to develop costs for Montana WWTPs[2] that were applied here. Based on various assumptions applicable to the Montana setting, upgrade costs were estimated for each plant for each 5-year permit based on the nitrogen and phosphorus variance limits in the regulatory language. These included facility upgrade capital and O&M costs. In addition, the net present value (NPV) was also calculated using a 3.3% inflation factor over a 20-year life cycle. This NPV cost was also used for comparisons to point source trading costs. This analysis found that approximately $87 million dollars (in 2014 dollars) will be needed for potential upgrades for the 27 WWTPs identified to meet variance limits over the 20 years for which variances will be available.

1.2 Credit Supply

Assessment of nutrient credit supply in Montana focused on hypothetical implementation of conservation practices in agriculture and forestry. To a limited degree, the supply assessment also examined TN supply through septic system disconnection programs. Estimated annual and seasonal NPS loads (July-September corresponding to the period nutrient standards application) for TN and TP were estimated for all the HUC-12 watersheds in the state based on land cover. Designated Wilderness Areas were removed from consideration as directed by MDEQ.

An empirical method was used to calculate pollutant loads using event mean concentrations (EMCs), monthly average precipitation values, and imperviousness percent coverage values per land use category. This method provided a very coarse estimate of nutrient loads delivered by surface runoff for each land use category in a watershed. Preliminary loading calculations were used here to: 1) estimate the nonpoint load from various land uses at the HUC-12 level; and, 2) assess the potential for nonpoint source credit generation of nutrients from limited portions agricultural and forest lands situated upstream of WWTPs potentially needing to consider trading. Nonpoint source loads were manipulated to derive credits for direct comparison to WWTP demand by applying a trading ratio or 2:1.

1.3 Comparison of Demand and Supply

Evaluating the viability of a Montana trading market was based on: 1) the determination of whether there was ample credit supply from NPSs to meet the demand of PSs, and 2) whether there were substantial cost savings with trading versus WWTP upgrades. The comparison of demand versus supply was completed for the 27 identified potential point sources identified in the demand analysis that should consider trading. Of these, only 19 would likely realize ample credit supply considering both TN and TP. TN credits, based on the methods applied were only predicted to be in short supply for two plants based on small upstream watersheds from which credits could be produced. TP supply was a substantially different picture than TN whereby calculations suggested TP shortages for 7 WWTPS even with the most generous crediting scenarios of substantial upstream landowner participation.

Comparison of credit volume demand and supply was next used to compare costs for WWTP upgrades versus agriculture and/or forestry credits to determine whether there were associated economic benefits for this type of trading in the various Montana settings. These comparisons revealed that there were slightly over half of the 27 point sources that would find trading (and then

[1] "Striking the Balance between Nutrient Removal, Greenhouse Gas Emissions, Receiving Water Quality, and Costs, WERF Nutrient Removal Challenge Report, Michael Falk, David Reardon, JB Neethling, David Clark, Amit Pramanik, December 2013".
[2] "Wastewater Treatment Performance and Cost Data to Support an Affordability Analysis for Water Quality Standards, May 31, 2007".

only for TN), cost-effective using Project Team assumptions for agriculture and forestry NPS credits.

Six major dischargers and 8 minor dischargers were identified as having suitable conditions for WQT. These included the major dischargers of: Western Sugar Cooperative, Missoula, Dillon, Bigfork, Miles City and Havre. Minor dischargers included: Elkhorn Health Care, East Helena, Manhattan, Conrad, Montana Behavioral Health, Rocker, Lolo and Absarokee. Missoula was the largest facility that might benefit from TN trades where credit costs were 31% of upgrade costs. Miles City would stand to save nearly 85% or $5M of projected upgrade costs with TN trading. Potential nitrogen treatment savings with NPS credits for all 14 potential buyers ranged from 1-31% of upgrade costs. Of the more than $23M in projected upgrade costs for these 14 PSs to meet TN limits, equivalent TN trading costs were estimated at $3.2M, an approximate $20M savings over 20 years. This reflected an average of 14% of the cost of upgrades for all facilities. NPS phosphorus credits were not cost-effective for any facility as credit costs ranged from an estimated $58-161/credit compared to equivalent unit upgrade costs of approximately $4-25/pound.

Of particular note for any potential PS/NPS trading scenario examined in Montana was the limitation of NPS runoff-generated credits largely due to very low rainfall during the critical months of July to September (typically <2 inches). In some cases, facilities lacking trading opportunities were located in headwater areas where there was insufficient upstream land to generate such credits. For others, beneficial cost differentials between WWTP upgrades and NPS credits did not exist. Notably in some settings with larger facilities, the potential to obtain additional nitrogen offsets from septic system disconnects, though expensive, was possible and considered a feasible alternative where NPS TN credits were in short supply or too difficult to aggregate. Though not considered in this study because of a paucity in available research findings and/or site-specific details needed for credit calculations, were nitrogen reductions from improved irrigation practice management as a possibility in select areas where upstream irrigation was present above a WWTP. Such options would need to be identified on a case-to-case basis.

There were certain trading options identified whereby any point source considering trading might purchase credits initially for TN to provide compliance for one or more permit cycles before plant upgrades became necessary to meet future more stringent TN effluent limits. Conversely, certain facilities might consider upgrading in earlier permit cycles to meet second or third permit cycle nutrient targets, then use trading for a much smaller incremental level of required reductions with latter permit cycles. Such considerations reinforced a fundamental premise of trading; all potential buyers must each carefully examine their own particular needs and opportunities.

1.4 Business Case Considerations and Recommendations

Based on study findings, the Project Team identified that there appeared to be a relatively limited number of potential point source/nonpoint source trading opportunities in Montana. These were also likely to be spread out over four permit cycles. Results of estimating treatment plant upgrade costs compared to costs of water quality credits produced by agriculture and forestry practices did, however, indicate that purchase of credits can offer a lower cost of compliance for some but not all treatment plants and watersheds. During the next few years the regulatory schedule for variances will impose water quality improvement mandates on relatively few plants positioned to benefit from trading. Accordingly, establishing a comprehensive WQT framework and state program to manage credit trading (such as a registry, full time staffing, etc.) is not recommended by the Project Team at this time.

That said, a relatively modest level of further regulatory guidance would reduce uncertainties and transaction costs to parties interested in credit trading, thereby boosting the chances for Montana to realize economic gains from trading. Additional guidance would help lead to standardization of matters such as credit calculations, trade ratio determination, crediting-project verification and permit modification procedures. This could be important regulatory infrastructure that would enhance the ability to complete sensible, cost-lowering trades and minimize MDEQ administrative burdens. The prospects for Montana to realize overall benefits from WQT may thus be enhanced through one-time investments that provide a reasonable opportunity to help potentially benefited credit buyers to become actual buyers.

The Project Team therefore recommends that MDEQ:

- Not invest in formally developing any specific and/or prescriptive WQT program framework under CIRCULAR DEQ-13. Rather, MDEQ should simply allow point sources that might choose to trade, to best determine how they should each proceed under CIRCULARS DEQ-12A, 12B and 13 absent a formal WQT framework.
- Alternatively consider limited investments to write appendices to DEQ-13 that clarify and facilitate credit calculation methods, provide standardized forms for trading participants and lay out expectations for crediting project verification and aggregator participation.
- Consider limited investments in expenditures for public outreach and/or workshops related to DEQ-13 suggested appendices.

Based on best professional judgment and Project Team experience, implementation costs for these latter two recommendations are estimated to minimally range from $150,000-$220,000 assuming outside contractor assistance.

Overall, this investment strategy facilitates what will likely be limited trading through bilateral exchanges between buyers and sellers and/or buyers and aggregators. It eliminates the need for formal program development and management as these elements that are already allowed in the existing trading policy. Trading integrated into the existing permit process should also be within the current purview of permit writers. Buyers and sellers would therefore bear the bulk of responsibilities for trading.

MDEQ investment at this time is not deemed as essential by the Project Team for future WWTP application and use of the trading policy. MDEQ investment in some or all of the recommended elements will simply help facilitate trades and reduce future costs associated with transactions and administration of potential trades. Fundamentally, all additional elements developed to facilitate trades under the existing policy, could be documented in appendices to DEQ-13, and easily integrated into existing MDEQ program functions.

2.0 INTRODUCTION

The Project Team of Morrison-Maierle (Helena, MT), Kieser & Associates, LLC (Kalamazoo, MI), and M J Walsh & Associates, Inc. (Downers Grove, IL) was retained by the State of Montana Department of Environmental Quality (MDEQ) to develop a "business case" for Water Quality Trading (WQT) in Montana. The purpose of the business case was to assess viable-market program structures to support nutrient trading in Montana in conformance with ARM 17.30.1701, incorporating by reference, Montana's Policy for Nutrient Trading (CIRCULAR DEQ-13). The business case includes costs for a one-time-only MDEQ investment in launching such a program. This report presents the business case by documenting the analyses, findings and conclusions of the Project Team's efforts to identify future MDEQ investment options in WQT. Such efforts included:

- Assessment of nutrient demand (Total Phosphorus – TP and Total Nitrogen – TN) by municipal and industrial wastewater treatment plants (WWTPs)
- Assessment of nutrient credit supply from implementation of conservation practices in agriculture and forestry as well as septic system disconnection programs
- Comparison of demand and supply crediting opportunities including comparison for costs (i.e., trading versus WWTP upgrades)

The Project Team recognizes the importance of establishing a business case for nutrient trading in Montana. The functional framework for WQT programs depends principally on the size of the market. More sophisticated programs, like central clearinghouses for example, are most efficient where there is substantial market demand for trading credits with multiple buyers and thus the need for multiple sellers in a single watershed or across many watersheds. These can manage complex program accounting and reporting, as well as related activities for verification and oversight. Limited compliance demand for WQT credits, even modest demand but temporally distributed over decades, would suggest that such a robust, complex framework with numerous moving parts would be inefficient and expensive considering costs and human resources. Alternatively, markets with limited demand may function more effectively with bilateral trades and/or market facilitators such as brokers and aggregators. Consistent throughout all efficient programs, however, are standardized methods and approaches for administrative, legal, regulatory, and technical program elements.

Recently promulgated nutrient standards, TMDLs, and new growth will require permitted dischargers to consider various compliance options to meet more stringent effluent limits, offset impacts of additional or new discharges of phosphorus and nitrogen, and/or protect high quality waters. Montana's nutrient trading policy was established to provide an additional compliance option. The policy allows for various trading options, including point source-point source and point source-nonpoint source trades. Montana Pollutant Discharge Elimination System (MPDES)-permitted dischargers, septic systems, agriculture, and other private parties are noted in the policy as potential participants in nutrient trading. The policy has only been used a few times for septic system trades, although it can be anticipated that a range of potential users will now surface given near and long-term nutrient compliance requirements.

Given this pending need, a business case has been rapidly developed that principally targets potential nutrient credit demand by point sources (PSs) including municipal and industrial WWTPs spatially and temporally, and corresponding credit supply from nonpoint sources (NPSs) associated with agriculture and forestry conservation practices. The following sections identify how the Project Team prepared the business case to: 1) identify an effective trading framework or policy needs to accommodate the results of this rapid assessment of demand and supply; and

2) assist MDEQ with identifying a strategic, one-time investment for establishing trading program opportunities and/or policy enhancements.

2.1 Overview of Approach

Though treatment technology is well understood, a variety of considerations must be made on a case-by-case basis to assess what each point source must do to potentially meet more stringent nutrient effluent requirements. Thus, the major wastewater treatment plants (WWTPs), smaller mechanical treatment plants, and dozens of wastewater lagoon facilities in Montana all will need to eventually assess compliance options and costs. The Project Team addressed this challenge by tapping into the existing experience of Morrison-Maierle with wastewater dischargers in the state, permit information from MDEQ, and direct contact with select wastewater operators for the major dischargers and mechanical plants where necessary. Assessment of demand stems from the compilation of this information in light of pending and future regulatory conditions.

A finite analysis of credit supply was challenging given a lack of watershed nonpoint source loading data, limited available information on current practices, and even assessing landowner willingness to potentially engage in trading. The Project Team therefore employed a relatively broad-based empirical modeling approach for nonpoint source loading. This approach was used successfully in the business case analysis of the multi-state Ohio River Basin trading program. Replicated here for Montana, the team interacted with the Montana Association of Conservation Districts (MACD) and State USDA-NRCS office in an attempt to identify current practices, commonly employed Best Management Practices (BMPs) and associated life cycle costs (20-year net present value) to broadly estimate nutrient reduction costs. Feedback in these regards, proved to be quite limited.

Based on demand and supply results, the Project Team spatially and temporally examined nutrient trading opportunities to forecast: 1) cost-savings with WQT based on cost differentials between WWTP upgrades versus use of nutrient credits from agriculture; and 2) the potential scale of trading that may occur in Montana to assess the scope and magnitude of MDEQ investment for future trading.

This information is presented in the following report sections:

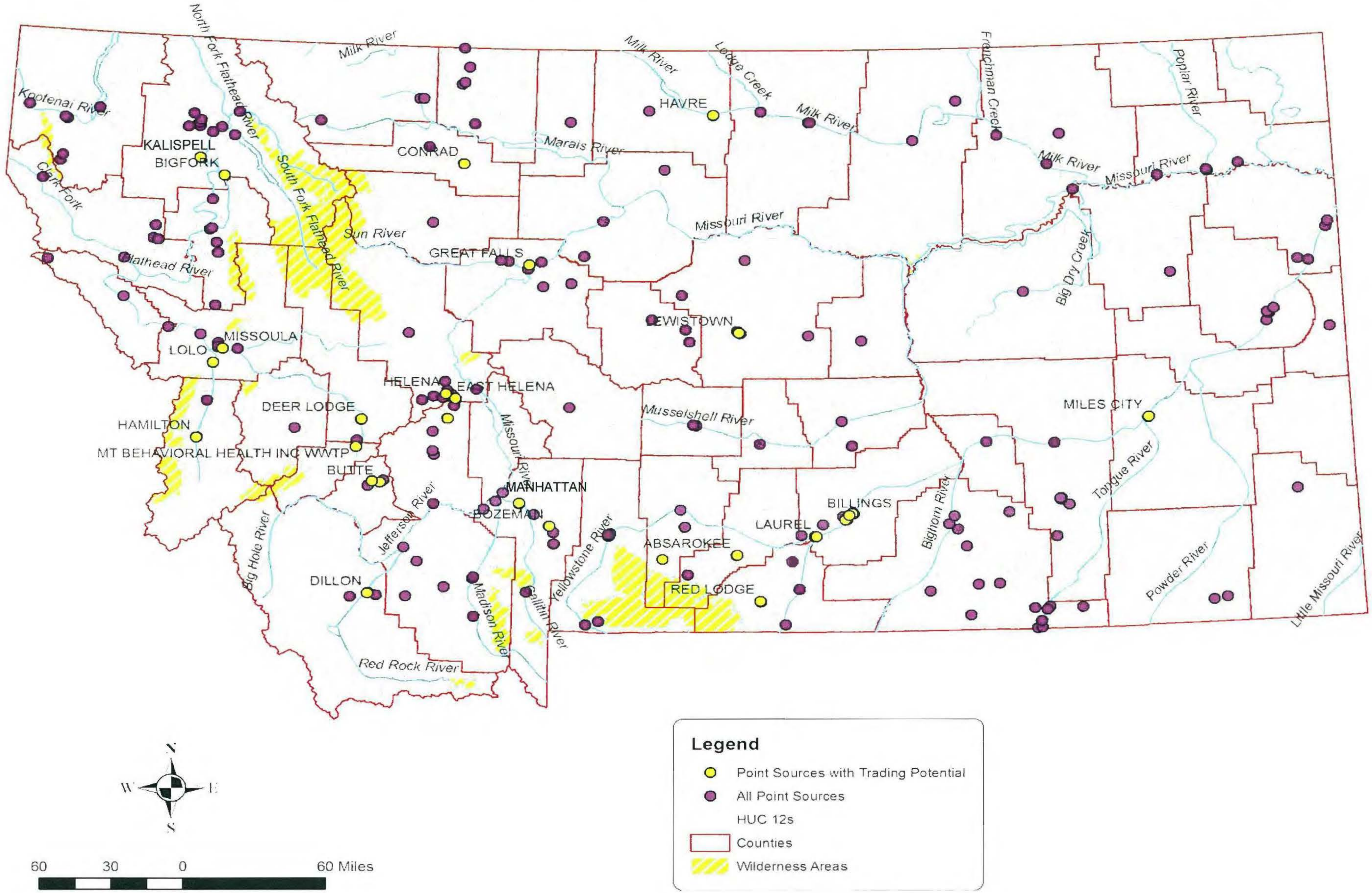
3.0 ASSESSMENT OF CREDIT DEMAND

3.1 Overview

For this assessment, potential demand for WQT credits was explored in the context of spatial and temporal scales for municipal and industrial WWTPs. The assessment of trading demand focused on the largest WWTPs and other facilities with mechanical treatment technology. Demand was represented by difference in current WWTP loads and future loads under nutrient standards. If current treatment technology and built infrastructure was capable of meeting anticipated future effluent limits reflecting the new instream standards, the facility was not considered as a potential buyer of NPS nutrient credits. Otherwise, PSs likely requiring some form of facility upgrade were targeted for the demand assessment.

3.2 WWTP Demand Analysis

Demand was examined on spatial and temporal scales recognizing various WQT drivers and permit cycles. This initially involved mapping point source locations (to identify potential trading areas by subwatershed). Figure 3-1 shows the location of the more than 200 permitted facilities considered in this application in relation to HUC-12s. The second element of this effort focused on assessing readily available treatment information (current loads, effluent concentrations, mean and maximum discharges, treatment methods and capacity). Information was obtained from MDEQ, Protect Team files and communications with the largest facilities and others with mechanical treatment technology. Trading demand was determined from MDEQ's DEPARTMENT CIRCULAR DEQ-12A, Montana Base Numeric Nutrient Standards and DEPARTMENT CIRCULAR DEQ-12B, Nutrient Standards Variances to define the temporal conditions of potential demand and the scale of such demand.



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Map of All Permitted Dischargers in Montana

Possible Credit Buyers in Yellow

PROJECT NO. 4842.008

FIGURE NUMBER 3-1

3.2.1 Analysis Methods

Demand analysis started with creating a list of all municipal wastewater dischargers and industrial dischargers in Montana. Discharge Monitoring Reports (DMRs) were requested and analyzed for all of the dischargers for the period 2010 through 2014. Flow, Total Nitrogen (TN), and Total Phosphorus (TP) were collected and analyzed from the DMR data and are summarized in Appendix A.

The first modification to the list was to remove industrial discharges without nutrients in their effluent. MDEQ suggested using Appendix A of "Demonstration of Substantial and Widespread Economic Impacts to Montana That Would Result if Base Numeric Nutrient Standards had to be Met by Entities in the Private Sector in 2011/2012, MDEQ, December 2012" to make that cut since they had already analyzed which industrial dischargers to include in that study. The next modification was to remove dischargers on reservations (these are under the control of EPA Region 8 and not under the purview of MDEQ). The list was then categorized as follows:

- Dischargers who discharge to "Large Rivers" as defined in Table E-1 in "MDEQ Circular DEQ-12-A"
- Industrial discharges to wadeable streams
- Municipal dischargers to wadeable streams with more than 1,000 residents
- Municipal dischargers to wadeable streams with less than 1,000 residents.

This initial list also included location information (from EPA public information), permit expiration dates (from EPA public information), flow information (from DMR data), treatment type (lagoon or mechanical from individual permit descriptions), and the HUC-12 designation (from EPA public information) where each plant discharges. Appendix A shows this initial list of dischargers.

The discharger list was discussed at an initial meeting with the Project Team and MDEQ representatives involved in the project. One of the decisions made early in that meeting was to remove municipal dischargers with less than 1,000 residents from the study. Almost all of these systems are lagoons that do not discharge during all months (most only discharge 6-7 months per year). These systems may be able to make simple operational changes so that they do not discharge during the months where nutrient limits will be applied (July-September). Other systems might have farmers and ranchers nearby that can use the effluent during the summer months. The premise here is that the costs to build an equalization basin and contribute to some improvements on the landowner's irrigation system are likely to be much less than nutrient trading. While there might be a few small dischargers (<1,000 residents) that will be interested in undertaking nutrient trading, it was decided that the trading approach that is ultimately implemented based on the analysis of the remaining systems would also apply to smaller systems.

Industrial dischargers were then analyzed closely related to flow, nutrient load, and receiving water. Several were removed from the analysis because it was relatively obvious that their mixing zones would be large enough relative to their discharge that reasonable potential would not exist for them to have a nutrient discharge limit. MDEQ agreed with the Project Team to review the remaining list of dischargers related to TMDL implementation and schedule, receiving water status (impaired or not), and their knowledge of ongoing studies and upgrade plans for the dischargers. MDEQ then identified other dischargers that should be removed from the study. These changes were made and are presented in the next section.

3.2.2 WWTP Demand Analysis Results

The final list of dischargers with potential trading demand is presented in Table 3-1. The table includes permit number, discharger name, location, flow information, historical effluent nutrient concentrations, type of plant, and classification (major or minor) for 27 PSs. Where upgrades were known to be underway (either in design or construction), the anticipated effluent nutrient concentrations after upgrade were included. Where treatment plants have been upgraded between 2010 and 2014, only the data after the upgrade were used in the analysis.

WWTP nutrient demand was calculated for each discharge permit over four discharge cycles (20 years). For the discharges that currently use lagoons, it was assumed that they would initially get ammonia limits and be allowed to upgrade their treatment to meet those limits before nutrient limits started to be applied (if the lagoon was upgraded to a mechanical plant to meet ammonia limits).

Nutrient removal demand for each treatment plant was based on historical performance (or expected performance if an upgrade is in process) compared to the variance limits in the regulations.

Some treatment plants will eventually need to meet more stringent limits if they are currently performing at a higher level than the variance limits. There could also be treatment plants that will be held to lower standards than the variance limits depending on their receiving stream water quality and flow versus treatment plant flow. Additional nutrient limit considerations will apply if a receiving stream has a TMDL with higher wasteload allocations than the variance requirements. In all cases examined herein, the Project Team used variance limits as directed by MDEQ.

Finally, a flow increase was assumed for each treatment plant at 2 percent for each permit cycle. This equates to approximately 0.5 percent per year. This growth assumption is valid for the vast majority of Montana towns but there are a few towns and cities that will grow at a faster rate. These would likely include those near the eastern border (from the North Dakota oil boom) or possibly some of the larger cities like Billings, Bozeman, or Missoula. However, for the purposes of this study, it was decided that having different growth rates and for which cities and towns have different growth rates and by how much was beyond the scope of this study and would not affect the final recommendation. Thus, the same growth rate was applied across the board.

Table 3-1: Point Dischargers Included in Study

NPDES ID	Description	Population	Latitude	Longitude	Effective Date	Expire Date	Design Flow	Average Flow	Maximum Flow	Average TN (mg/l)	Average TP (mg/l)	Size
MT0026808	STILLWATER MINING EAST BOULDER		45.502500	-110.083889	8/1/2000	7/31/2005	0.65	0.23	0.42	3.3	5.1	Minor
MT0022594	MISSOULA	66,788	46.874160	-113.994600	11/1/2006	10/31/2011	8.99	7.06	10.39	9.3	0.47	Major
MT0021938	KALISPELL	19,927	48.176690	-114.309360	9/1/2008	8/31/2013	5.40	2.70	4.80	8.1	0.12	Major
MT0020478	RED LODGE	2,125	45.213389	-109.240861	3/1/2009	2/28/2014	0.29	0.59	1.30	14.5	2.2	Minor
MT0020311*	LAUREL*	6,718	45.657500	-108.752222	7/1/2009	6/30/2014	0.50	0.94	1.60	8	3	Major
MT0022560	EAST HELENA	1,984	46.589460	-111.921020	10/1/2009	9/30/2014	0.63	0.37	0.81	14.8	2.5	Minor
MT0023566	ELKHORN HEALTH CARE WWTP		46.449444	-111.985278	11/1/2009	10/31/2014	0.02	0.00	0.02	21.3	2.7	Minor
MT0000281	WESTERN SUGAR COOPERATIVE		45.770000	-108.500833	12/1/2009	11/30/2014	9.36	0.73	N/A	13.4	0.2	Major
MT0021750	ABSAROKEE	1,150	45.531111	-109.440000	2/1/2010	1/31/2015	0.35	0.26	N/A	14.8	1.8	Minor
MT0021458	DILLON	4,134	45.230556	-112.618611	3/1/2010	2/28/2015	1.10	0.36	0.63	32	4.9	Major
MT0020397	BIGFORK	4,270	48.063780	-114.083100	8/1/2010	7/31/2015	0.69	0.22	0.39	13.6	0.3	Major
MT0021857	MANHATTAN	1,520	45.877080	-111.332420	9/1/2010	8/31/2015	0.40	0.13	0.70	10.5	1.1	Minor
MT0021920*	GREAT FALLS*	58,505	47.519889	-111.300778	12/1/2010	11/30/2015	21.00	10.00	25.50	8	2.3	Major
MT0020001	MILES CITY	8,410	46.430550	-105.830900	4/1/2011	3/31/2016	1.98	1.13	1.80	23.7	2.5	Major
MT0022535*	HAVRE*	9,310	48.559444	-109.662500	5/1/2011	4/30/2016	1.80	1.55	2.59	8	1.9	Major
MT0020028	HAMILTON	4,348	46.253300	-114.175790	9/1/2011	8/31/2016	1.98	0.64	0.88	5	4.6	Major
MT0020079	CONRAD	2,570	48.204444	-111.919167	2/1/2012	1/31/2017	0.65	0.23	0.94	14.2	3.2	Minor
MT0022012*	BUTTE*	33,525	45.996960	-112.553600	4/1/2012	3/31/2017	8.50	3.78	4.83	3	0.3	Major
MT0022608	BOZEMAN	37,280	45.722778	-111.067778	6/1/2012	5/31/2017	5.78	5.55	8.40	6.6	1.1	Major
MT0021431	MT BEHAVIORAL HEALTH		46.237222	-112.776528	8/1/2012	7/31/2017	0.10	0.00	0.01	29	5.7	Minor
MT0020044	LEWISTOWN	5,901	47.064060	-109.424980	9/1/2012	8/31/2017	2.83	1.88	3.90	2.6	0.5	Major
MT0022641	HELENA	28,190	46.619167	-112.005000	10/1/2012	9/30/2017	6.00	3.06	9.05	6.5	2.4	Major
MT0022616*	DEER LODGE*	3,111	46.429167	-112.739167	3/1/2013	2/28/2018	2.40	1.27	8.40	6.1	1	Major
MT0027430	ROCKER	100	46.004167	-112.623611	6/1/2013	5/31/2018	0.04	0.02	0.05	18.1	10.8	Minor
MT0030180	YELLOWSTONE ENERGY FACILITY		45.813333	-108.440278	5/1/2014	4/30/2019	0.25	0.12	0.23	NA	7	Minor
MT0020168	LOLO	3,892	46.774670	-114.070210	9/1/2014	8/31/2019	0.34	0.21	0.32	25	4.4	Minor
MT0022586*	BILLINGS*	104,170	45.802500	-108.466944	11/1/2014	10/31/2019	26.00	15.10	21.90	8	0.5	Major

*Currently upgrading facility (either in design or construction). TN and TP adjusted to expected performance after upgrade.

3.2.3 WWTP Upgrade Costs

Upgrade costs for all of the WWTPs were based on the final report "Striking the Balance between Nutrient Removal, Greenhouse Gas Emissions, Receiving Water Quality, and Costs, WERF Nutrient Removal Challenge Report, Michael Falk, David Reardon, JB Neethling, David Clark, Amit Pramanik, December 2013". This report is available through the Ingenta Connect website and a draft of this report was used by MDEQ to develop costs in the "Wastewater Treatment Performance and Cost Data to Support an Affordability Analysis for Water Quality Standards, May 31, 2007". This report was used as a basis for the "Demonstration of Substantial and Widespread Economic Impacts to Montana that would Result if Base Numeric Nutrient Standards had to be Met by Entities in the Private Sector in 2011/2012". This report ("Striking the Balance") presents nitrogen and phosphorus upgrade costs for a 10 mgd plant in the form of dollars per pound of nutrient to be removed (per season). The cost data were based on the assumption that the treatment plant is a basic 10 mgd activated sludge plant with primary treatment at 20 degrees Celsius capable of meeting typical BOD and TSS limits (referred to as Level 1). The report defines different levels of performance as follows:

- Level 1: Basic BOD / TSS removal activated sludge plant (no nutrient removal)
- Level 2: Basic Nitrification/Denitrification activated sludge plant (typically MLE) with alum addition for medium level phosphorus removal
- Level 3: 5-Stage Plant with enhanced denitrification (post-anoxic treatment) and enhanced biological phosphorus removal and alum addition for enhanced phosphorus removal and methanol addition for enhanced denitrification.
- Level 4: 5-Stage Plant with enhanced denitrification (post-anoxic treatment) and enhanced biological phosphorus removal and alum addition for enhanced phosphorus removal and methanol addition for enhance denitrification and filtration for limits of technology nitrogen and phosphorus removal short of using reverse osmosis technology.

Reverse Osmosis was also included in the report as part of Level 5 treatment but Level 5 treatment was not necessary for the purposes of this report so is not included here. The following effluent characteristics are associated with each level of treatment (1 through 4):

- Level 1: Activated Sludge with primary treatment, BOD < 30 mg/l, TSS < 45 mg/l, TN ~30 mg/l, TP~6 mg/l
- Level 2: Level 1 except TN < 8 mg/l, TP < 1 mg/l
- Level 3: Level 1 except TN 4-8 mg/l, TP 0.1 – 0.3 mg/l
- Level 4: Level 1 except TN <3 mg/l, TP <0.1 mg/l

For Montana, the "Base Numeric Nutrient Standards Implementation Guidance" sets the variance limits as guidance values as shown below:

For facilities >1 million gallons per day
- First permit cycle: 10 mg/l TN, 1 mg/l TP (or historical performance, if lower)
- Second permit cycle: 8 mg/l TN, 0.8 mg/l TP (or historical performance, if lower)
- Third permit cycle: 8 mg/l TN, 0.5 mg/l TP (or historical performance, if lower)
- Fourth permit cycle: Under development – for the purposes of this report the Fourth permit cycle was assumed to be 6 mg/l TN, 0.3 mg/l TP (or historical performance, if lower)

For facilities <1 million gallons per day
- First permit cycle: 15 mg/l TN, 2 mg/l TP (or historical performance, if lower)
- Second permit cycle: 12 mg/l TN, 2 mg/l TP (or historical performance, if lower)
- Third permit cycle: 10 mg/l TN, 1 mg/l TP (or historical performance, if lower)
- Fourth Permit cycle: 8 mg/l TN, 0.8 mg/l TP (or historical performance, if lower)

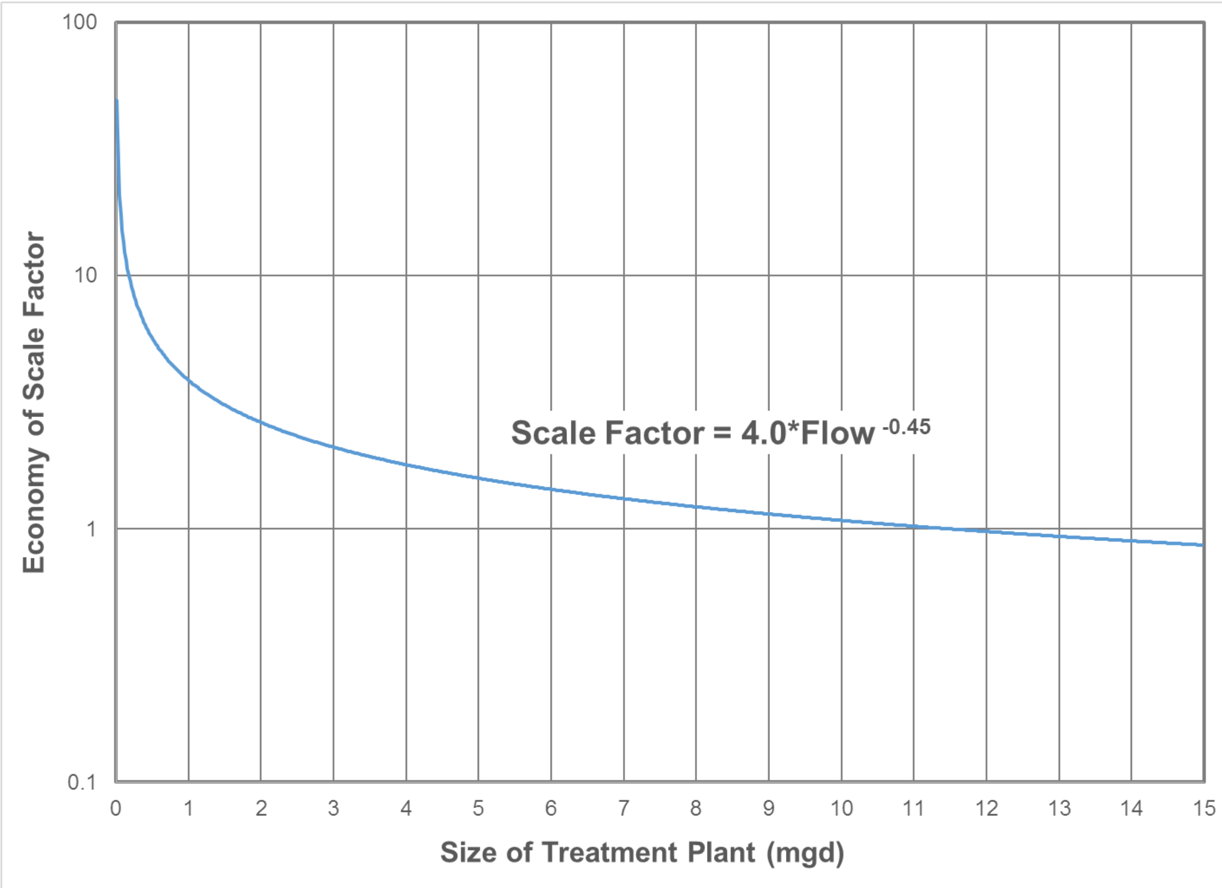
The costs presented in the "Striking the Balance" report were applied to the 27 dischargers in the Montana study group (Table 3-1). For capital costs, the calculated cost for 90 days (the MDEQ variance period) was multiplied by four because the infrastructure to remove nutrients must be built for the entire year, even though it will only be used for three months. The O&M costs were calculated for just the three months of assumed operation for phosphorous because in most cases, this will only consist of starting up a chemical feed system, but four and a half months was used for nitrogen to allow operators to bring the biological nitrogen removal process up to speed prior to the nutrient compliance period. There are some plants in Montana that perform biological phosphorous removal and biological nitrogen removal year-round and the O&M costs will be higher for those plants, but for the purposes of this report, there was no attempt to identify which plants fall under this category either now or in the future and it was concluded that this distinction would not change the final recommendations of the report. The following conclusions were made from the cost calculations in Montana:

1. Nitrogen upgrade costs were reasonably valid for treatment plants that fell within the 8-12 mgd average flow range but were significantly low for smaller treatment plants. It was obvious that an "economy of scale" factor needed to be applied to correctly estimate nitrogen upgrade costs for small plants in Montana. The economy of scale factor for nitrogen removal is shown in Figure 3-2. The reason for the economy of scale factor relates to the amount of additional volume and subsequent concrete tankage that needs to be constructed to allow for the additional anoxic nitrogen reduction, whether through endogenous decay or with the addition of carbon such as methanol or "Carbon C" or other commercially available carbon sources. Several iterations were applied before settling on the equation shown in Figure 3-2. Professional judgment and experience with several small treatment plant upgrades were used to settle on the final economy of scale factor equation. The economy of scale factor takes into account the increased cost of mobilization, demobilization, engineering, and general construction costs on a dollars/pound of removal basis for smaller treatment plants.

2. Phosphorus upgrade costs were reasonable when applied to all of the dischargers in the Montana study. The economy of scale factor was found not to be required. The reasoning for this is likely due to the fact that most treatment plants will need to apply some form of chemical feed system to remove phosphorus to the levels required to meet the variance limits. Most plants will not need to build significantly larger treatment basins to achieve phosphorus removal. For this reason, chemical feed systems and chemical costs will be very similar to all treatment plants on a dollars per pound basis. Therefore, no economy of scale factor was applied for phosphorous removal across the range of treatment plants studied in Montana.

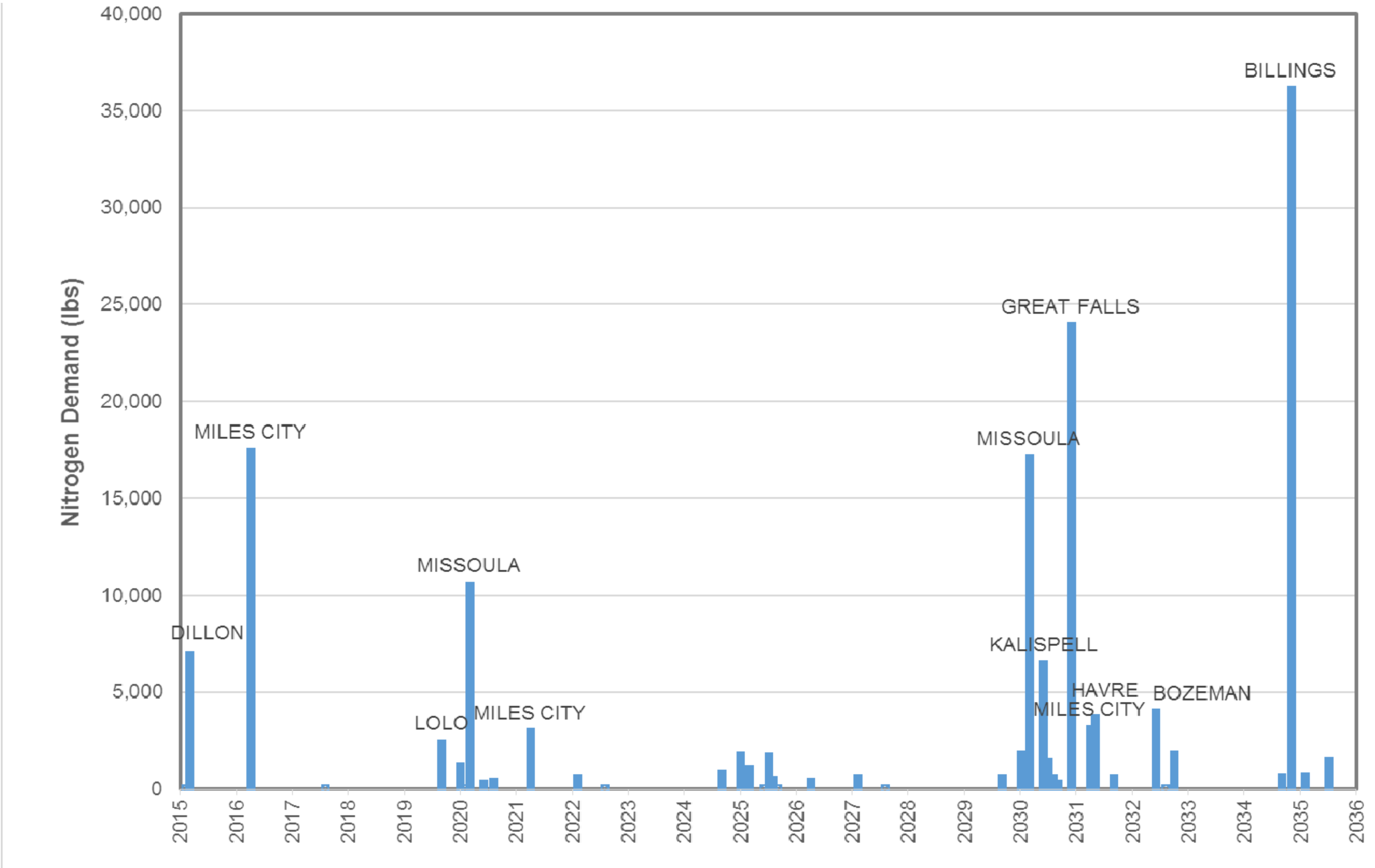
Based on the assumptions presented above, upgrade costs were estimated for each plant for each 5-year permit based on the nitrogen and phosphorus variance limits in the regulatory language (see Appendix B). It should be noted here that not all of the plants in this study will be subject to the variance limits. It is recognized that some will be held to a higher standard if they are performing at a higher level of treatment. It is also recognized that others will be held to a less stringent standard if they are on a large river with a large relative volume of mixing available, or if their TMDL (on a non-wadeable stream) creates differences from the variance requirements presented in this report.

FIGURE 3-2
ECONOMY OF SCALE FACTOR (NITROGEN UPGRADE COST ONLY)



It was beyond the scope of this project to attempt to predict which treatment plants would be given discharge limits for nutrients that are different than the adopted variance limits. Therefore, it was a conscious decision by the Project Team to make the simplifying assumption that all 27 dischargers would be held to the variance limits presented above. None of the dischargers will know for certain what their actual discharge limits will be until their MDEQ permit is issued and approved. This decision was recognized as a simplifying assumption but was agreed that it would not change the ultimate recommendation of this study. Based on the assumptions stated in this section, nutrient demand was calculated for each discharger in the study over the full 20 years where variances will be available based on CIRCULAR DEQ-12. These were then sorted over time and incremental and cumulative nutrient demand was calculated. WWTP nutrient demand is shown in Figures 3-3 through 3-6. Both incremental and cumulative demand are shown for nitrogen and phosphorous.

The facility upgrade capital and O&M costs were calculated as described above. In addition, the net present value (NPV) was also calculated using a 3.3% inflation factor over a 20-year life cycle. This NPV cost was used in subsequent sections of this report as a comparison point for nutrient trading costs. Upgrade costs are presented in Table 3-2 and incremental and cumulative costs are shown in Figures 3-7 through 3-9. As shown, approximately $110 million dollars (in 2014 dollars) will be needed for potential upgrades for dischargers in Table 3-2 to meet the variance limits over the 20 years where variances will be available.



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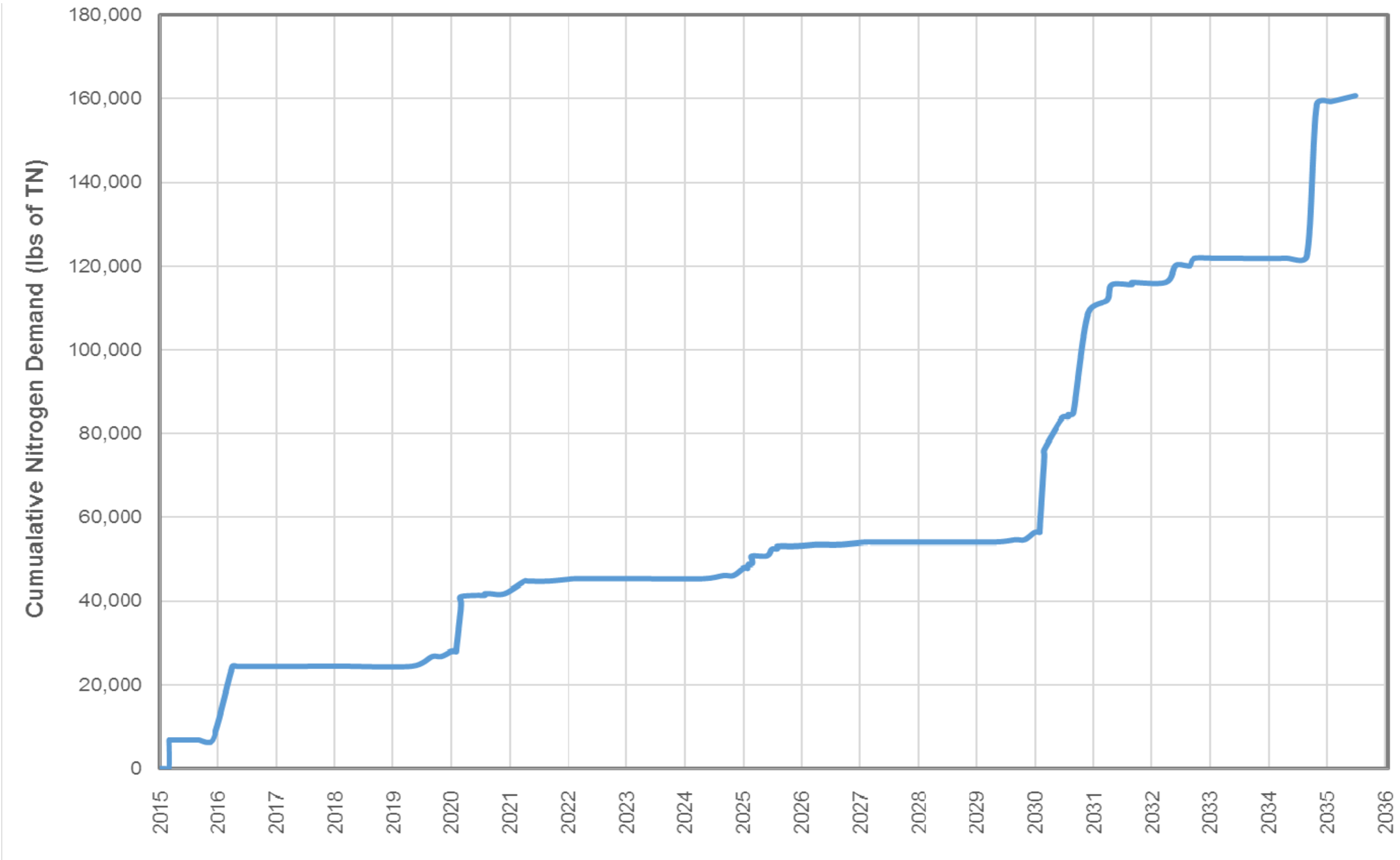
		Incremental Demand	FIGURE NUMBER 3-3



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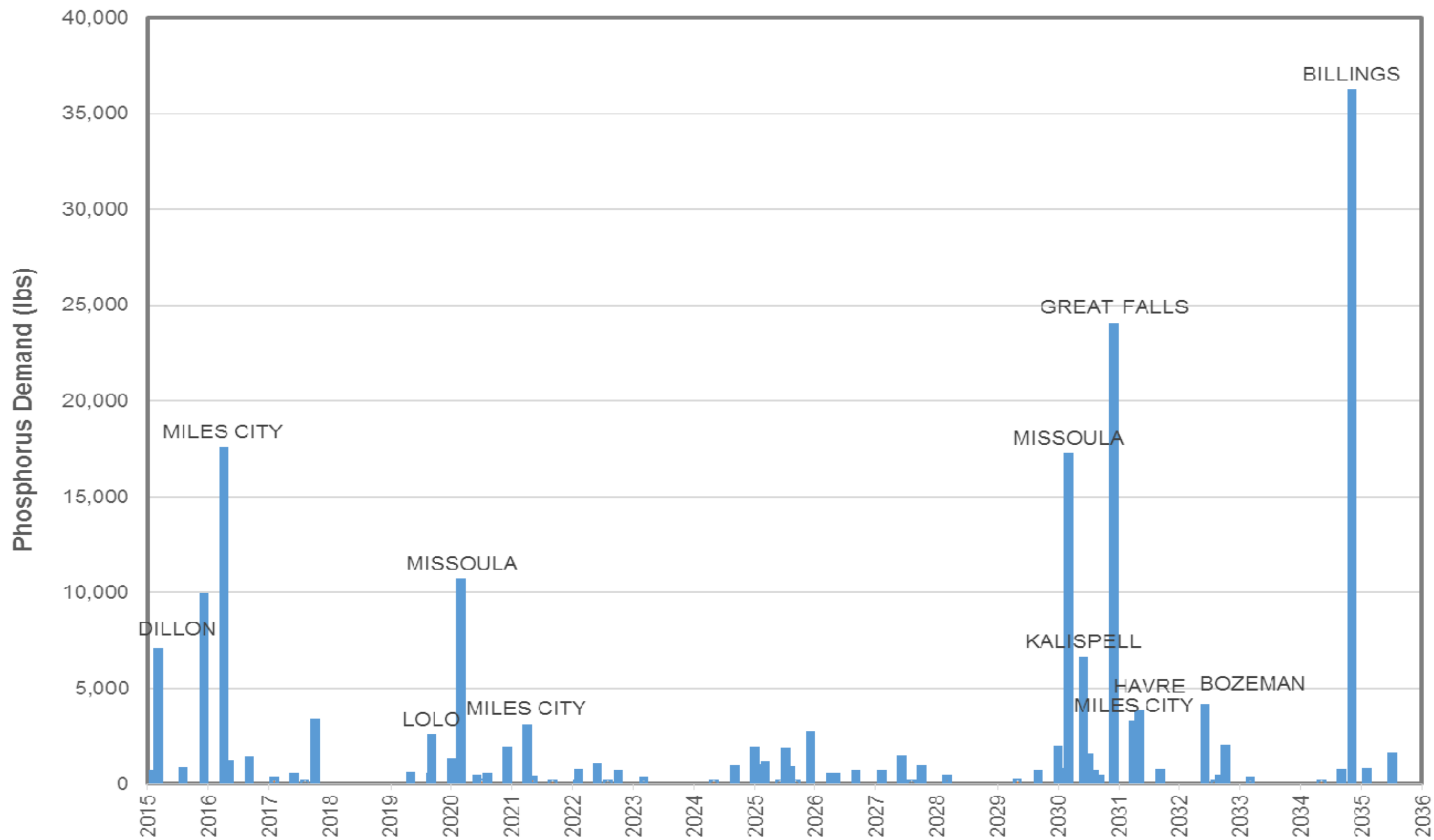
Point Source Nitrogen Demand	PROJECT NO. 4842.006
Cumulative Demand	FIGURE NUMBER 3-4



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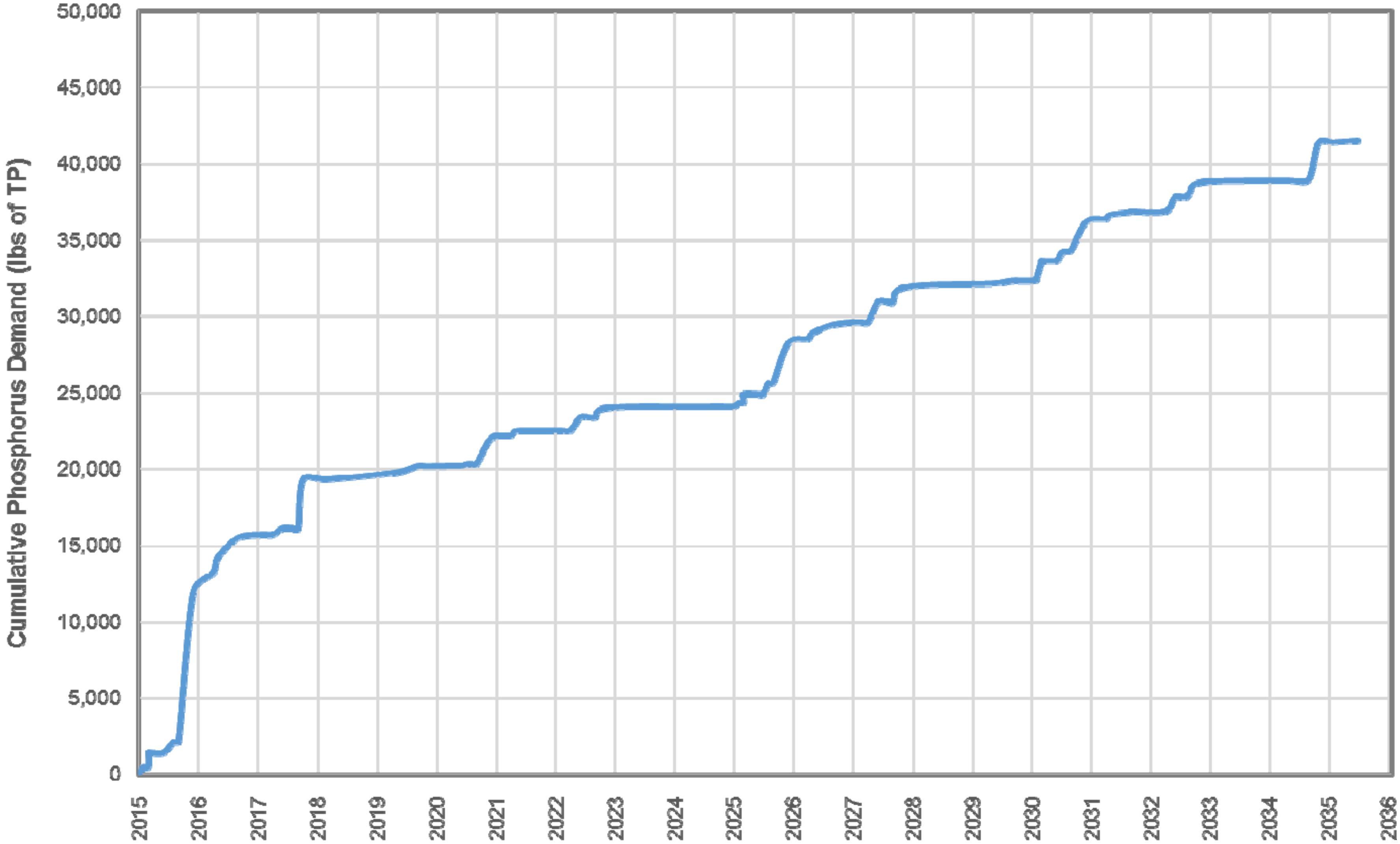
		Incremental Demand	FIGURE NUMBER 3-5



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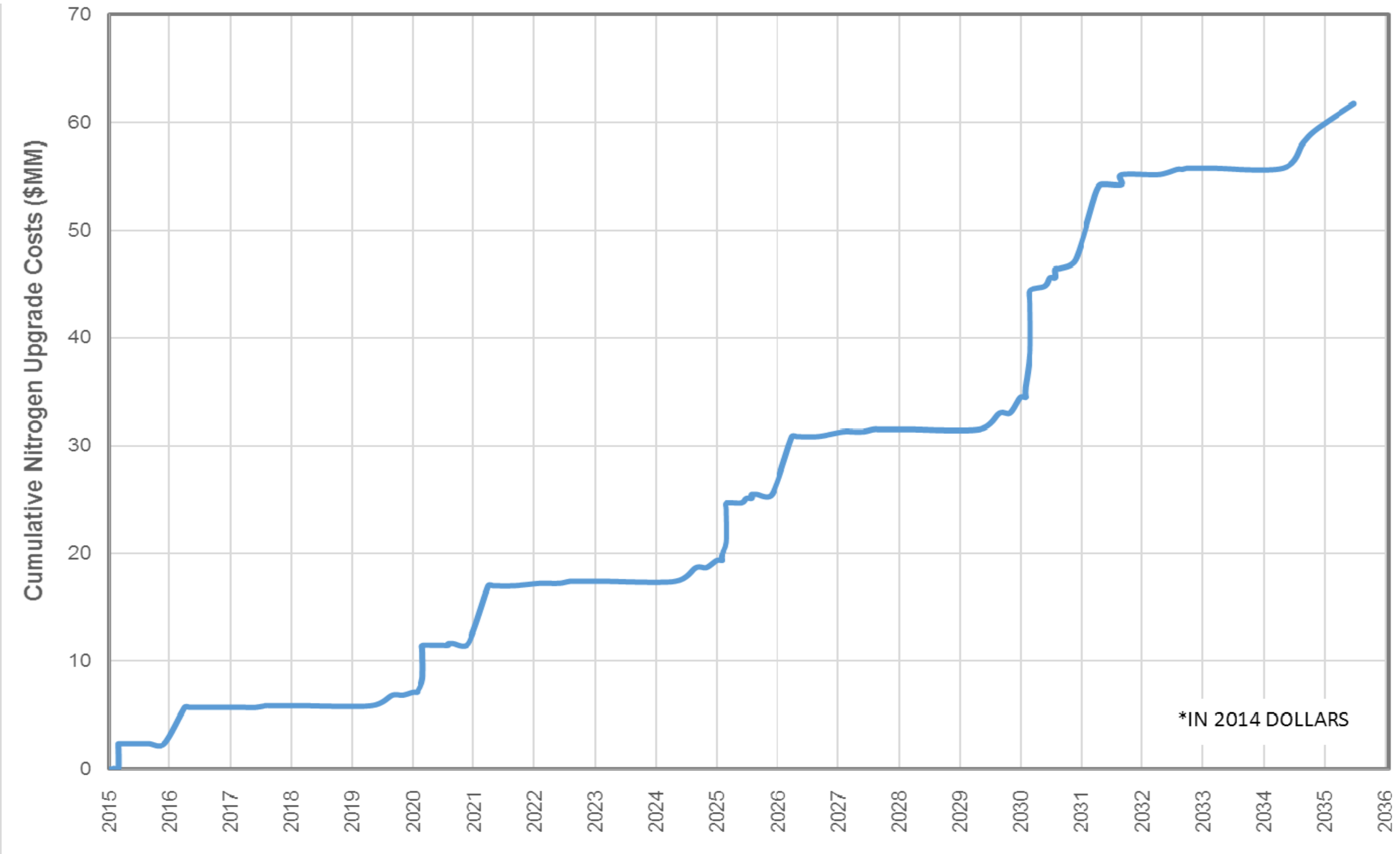
		Cumulative Demand	FIGURE NUMBER 3-6

Table 3-2: Upgrade Cost Summary

Description	Population	Final (4th) Permit Date	Average Flow (mgd)	TN total Demand (lb/season)	TN Uprade Cost (NPV)*	Annualized TN Upgrade Cost ($/yr)	Seasonal TN Upgrade Cost ($/lb)	Seasonal TN Upgrade Cost ($/person)	TP total Demand (lb/season)	TP Uprade Cost (NPV)*	Annualized TP Upgrade Cost ($/yr)	Seasonal TP Upgrade Cost ($/lb)	Seasonal TP Upgrade Cost ($/person)
STILLWATER E BOULDER		1/1/2030	0.23	0	$0	$0	N/A	N/A	788	$333,450	$29,072	$37	N/A
WESTERN SUGAR COOP		1/1/2030	0.73	3,140	$1,473,484	$101,809	$32	N/A	0	$0	$0	N/A	N/A
ELKHORN HEALTH CARE		2/1/2030	0.004	42	$207,066	$14,307	$338	N/A	6	$2,562	$223	$37	N/A
MISSOULA	66,788	3/1/2030	7.06	18,558	$3,418,153	$236,173	$13	$3.5	956	$144,574	$12,605	$13	$0.2
EAST HELENA	1,984	3/1/2030	0.37	2,004	$1,276,862	$88,223	$44	$44.5	501	$212,073	$18,489	$37	$9.3
DILLON	4,134	3/1/2030	0.36	6,901	$4,445,948	$307,187	$45	$74.3	1,179	$499,029	$43,508	$37	$10.5
KALISPELL	19,927	6/1/2030	2.70	4,516	$416,941	$28,808	$6	$1.4	0	$0	$0	N/A	$0.0
LAUREL*	6,718	8/1/2030	0.94	0	$0	$0	N/A	$0.0	1,647	$697,245	$60,789	$37	$9.0
BIGFORK	4,270	8/1/2030	0.22	981	$790,032	$54,586	$56	$12.8	0	$0	$0	N/A	$0.0
MANHATTAN	1,520	9/1/2030	0.13	263	$70,486	$4,870	$19	$3.2	32	$2,432	$212	$7	$0.1
GREAT FALLS*	58,505	12/1/2030	10.00	15,931	$815,896	$56,373	$4	$1.0	15,931	$7,924,084	$690,858	$43	$11.8
MILES CITY	8,410	4/1/2031	1.13	15,932	$6,141,728	$424,355	$27	$50.5	1,980	$838,177	$73,076	$37	$8.7
HAVRE*	9,310	5/1/2031	1.55	2,469	$825,727	$59,522	$24	$6.4	1,975	$836,154	$74,875	$38	$8.0
HAMILTON	4,348	9/1/2031	0.64	0	$0	$0	N/A	$0.0	1,943	$822,533	$73,655	$38	$16.9
CONRAD	2,570	9/1/2031	0.23	1,126	$892,031	$62,760	$56	$24.4	436	$184,493	$16,521	$38	$6.4
BUTTE*	33,525	4/1/2032	3.78	0	$0	$0	N/A	$0.0	0	$0	$0	N/A	$0.0
BOZEMAN	37,280	6/1/2032	5.55	2,651	$176,989	$14,879	$6	$0.4	3,534	$534,449	$50,130	$14	$1.3
MT BEHAVIORAL HEALTH		8/1/2032	0.00	67	$326,946	$22,657	$339	N/A	16	$6,608	$592	$38	N/A
LEWISTOWN	5,901	9/1/2032	1.88	0	$0	$0	N/A	$0.0	300	$23,091	$2,313	$8	$0.4
HELENA	28,190	10/1/2032	3.06	1,219	$106,346	$8,567	$7	$0.3	5,119	$2,546,008	$227,091	$44	$8.1
DEER LODGE*	3,111	3/1/2033	1.27	0	$0	$0	N/A	$0.0	708	$54,596	$5,468	$8	$1.8
ROCKER	100	6/1/2033	0.02	177	$401,586	$27,924	$158	$279.2	175	$74,175	$6,642	$38	$66.4
YELLOWSTONE ENERGY		5/1/2034	0.12	0	$0	$0	N/A	N/A	593	$250,846	$22,463	$38	N/A
LOLO	3,892	9/1/2034	0.21	2,884	$2,356,036	$165,671	$57	$42.6	611	$258,533	$23,151	$38	$5.9
BILLINGS*	104,170	11/1/2034	15.10	24,056	$1,023,464	$94,771	$4	$0.9	2,406	$363,784	$34,122	$14	$0.3
ABSAROKEE	1,150	2/1/2035	0.26	1,387	$1,042,714	$73,432	$53	$63.9	204	$86,313	$7,729	$38	$6.7
RED LODGE	2,125	7/1/2035	0.59	3,055	$1,577,634	$112,060	$37	$52.7	658	$278,493	$24,938	$38	$11.7
TOTALS	**407,928**		**58.1**	**107,359**	**27,786,068**	**$2,027,204**	**$19**	**$5.0**	**41,698**	**16,973,703**	**$1,521,543**	**$36**	**$3.7**

*20 Year NPV at 3.3% inflation. Cost is Ultimate Cost to Meet Limits in the Fourth Permit Cycle (Total 20-year cost to meet variance limits)



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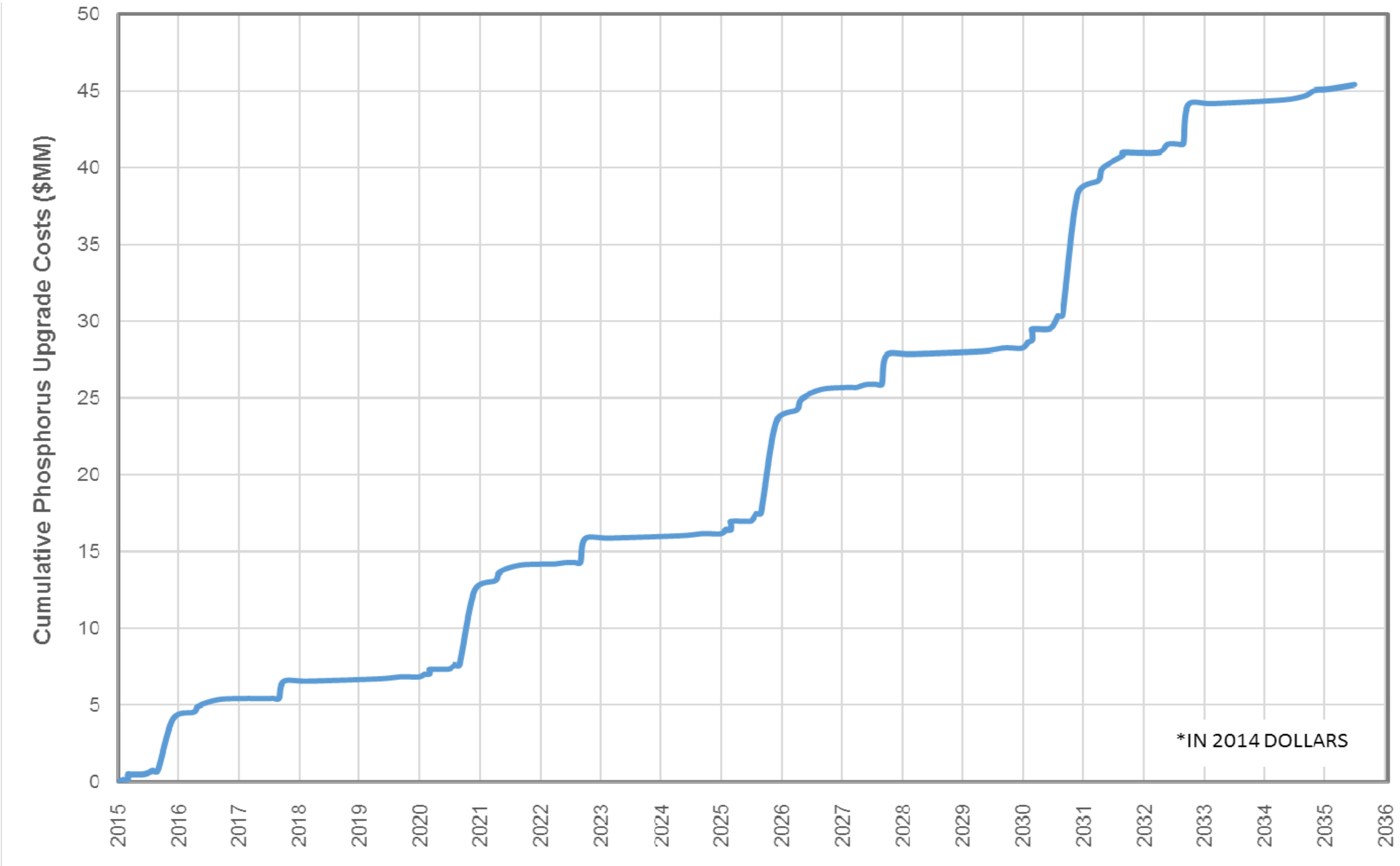
		Cumulative Upgrade Cost	FIGURE NUMBER 3-7

0010861



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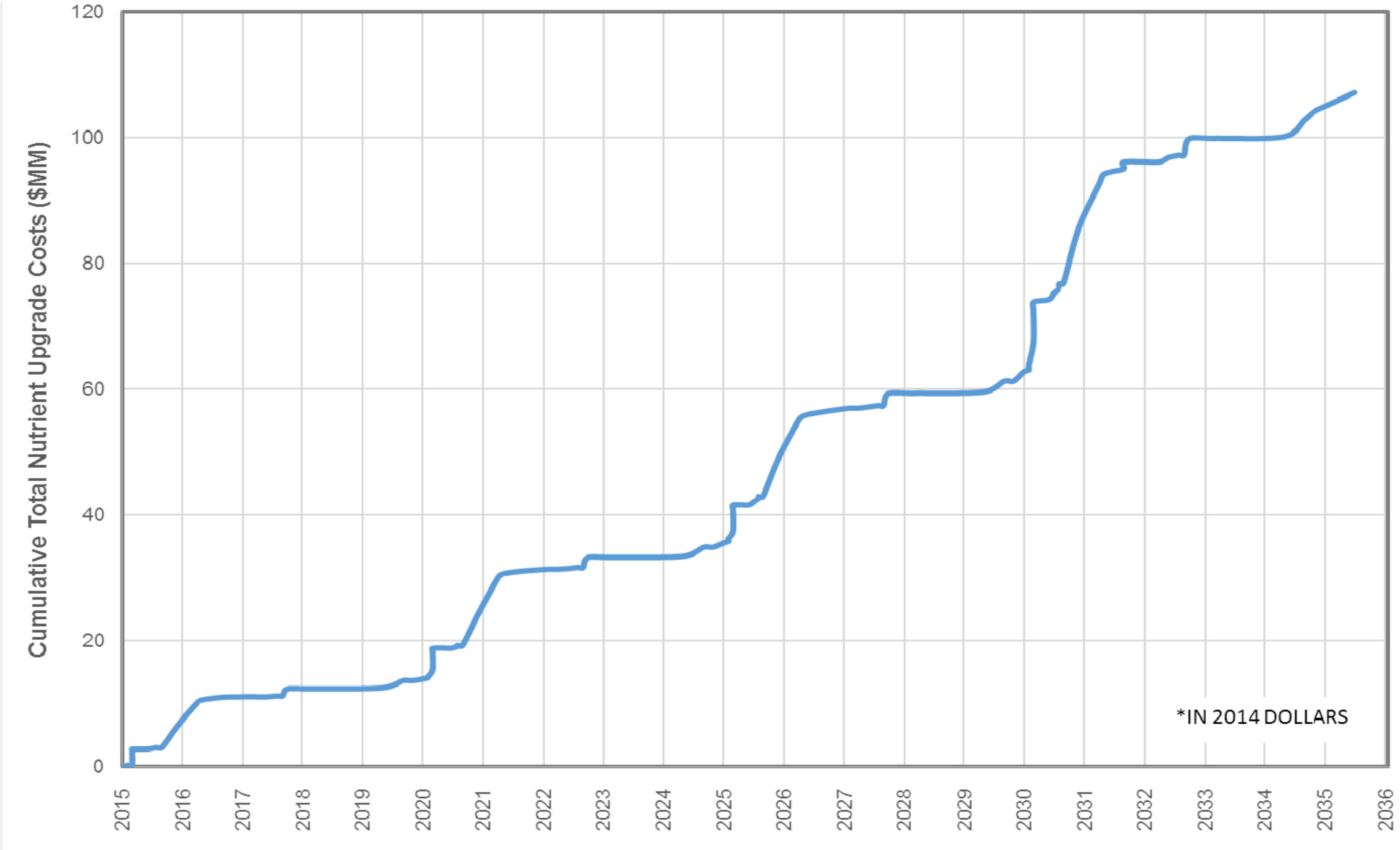
Point Source Phosphorus Cost	PROJECT NO. 4842.006
Cumulative Upgrade Cost	FIGURE NUMBER 3-8

0010862



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Point Source Nutrient Upgrade Cost

PROJECT NO. 4842.006

Cumulative Upgrade Cost

FIGURE NUMBER 3-9

4.0 ASSESSMENT OF CREDIT SUPPLY

4.1 Overview

This section of the Business Case presents the methods and results of the credit supply analysis. Annual nonpoint source nutrient loads for TN and TP were first estimated for all the HUC-12 watersheds in the state based on land cover. Designated Wilderness Areas were removed from consideration as directed by MDEQ. An empirical method was used to calculate pollutant loads using event mean concentrations (EMCs), monthly average precipitation values, and imperviousness percent coverage values per land use category. This method provides a very coarse estimate of nutrient loads delivered by surface runoff for each land use category in a watershed. These calculated loads do not consider fate and transport in overland flow or in channel processes and are therefore characterized as coarse estimates of TN and TP delivered to downstream areas by each tributary. Preliminary loading calculations are used here to: 1) estimate the nonpoint load from various land uses at the HUC-12 level; and, 2) assess the potential for nonpoint source credit generation of nutrients from agricultural and forest lands. Nonpoint source loads are manipulated to derive credits for direct comparison to WWTP demand.

4.2 Supply Assessment Modeling Methodology

The analysis used EMC values from available literature[3] (Table 4-1). Land use/land cover data were obtained from the 2011 National Land Use Dataset which are illustrated in Figure 4-1 (including the 27 PSs with the potential to trade).[4] Default imperviousness values (Table 4-2) were derived from the USGS 2011 National Land Use Dataset and the Rouge River National Wet Weather Demonstration Project[5]. Average monthly precipitation values (1981-2010) were

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[3] Average EMCs for this application were derived from various sources including: Baldys, S., Raines, T.H., Mansfield, B.L., and Sandlin, J.T. (1998). "Urban stormwater quality, event-mean concentrations, and estimates of stormwater pollutant loads, Dallas-Fort Worth area, Texas, 1992-1993," U.S. Geological Survey, Water-Resources Investigation Report 98-4158. Brezonik, P.L., and Stadelmann, T.H. (2001). "Analysis and predictive models of stormwater runoff volumes, loads, and pollutant concentrations from watersheds in the Twin Cities Metropolitan Area, MN, USA," Water Research 36, 1743-1757. Cave et al. (1994). Rouge River National Wet Weather Demonstration Project Technical Report: Nonpoint Source Data Assessment and Field Investigation RPO-NPS-TR03.00. Wayne County, MI. Guerard, P., and Weiss, W.B. (1995). "Water quality of storm runoff and comparison of procedures for estimating storm-runoff loads, volume, event-mean concentrations, and the mean load for a storm for selected properties and constituents for Colorado Springs, Southeastern Colorado, 1992," U.S. Geological Survey, Water-Resources Investigations Report 94-4194, Denver, CO. Harper, H.H. (1998). "Stormwater chemistry and water quality." Available at: http://infohouse.p2ric.org/ref/41/40258.pdf. Line, D.E., White, N.M., Osmond, D.L., Jenning, G.D., and Mojonnier, C.B. (2002). "Pollutant export from various land uses in the Upper Neuse River Basin," Water Environment Research 74(1), 100-108. Los Angeles County Department of Puhlic Works [LACDPW] (1999). Stormwater Monitoring Report: 1998-1999. Available at: http://ladpw.org/wmd/NPDES/9899TC.cfm. Omernik, J.M. (1997). "Nonopoint sources-stream nutrient level relationships: A nationwide study," U.S. EPA Report No. EPA-600/3-77-105, U.S. Environmental Protection Agency, Corvallis, OR. Pitt, R. (2011). The National Stormwater Quality Database, Version 3.1. Schueler, T., Hirschman, D., Novotney, M., Zielinski,J. (2007). "Manual 3: Urban Stormwater Retrofit Practices Manual:Urban Subwatershed Restoration Manual Series" Center for Watershed Protection, Ellicott City, MD. Smullen, J.T., Shallcross, A.L., and Cave, K.A. (1999). "Updating the U.S. nationwide urban runoff quality database," Water Science Technology 39(12), 9-16.

[4] USGS. 2014. National Land Cover Database 2011. Product Legend. Available from http://www.mrlc.gov/nlcd11_leg.php.

[5] Cave, K., Quasebarth, T., and E. Harold. 1994. Technical Memorandum: Selection of Stormwater Pollutant Loading Factors. Rouge River National Wet Weather Demonstration Project RPO-MOD-TM 34.00. Available from: http://rougeriver.com/proddata/modeling.html#MOD-TM34.00.

obtained from the national PRISM coverage with an 800m × 800m resolution.[6] One average monthly precipitation value for each HUC-12 watershed was calculated based on the number of PRISM coverage cells and the values of these cells. For this study, monthly precipitation values for July, August, and September were obtained. Monthly rainfall is illustrated in Figures 4-2a-c. Annual PRISM precipitation for the state is shown in Figure 4-3 as a comparison to monthly figures further illustrating the arid nature of most land covers in the state.

TABLE 4-1
EVENT MEAN CONCENTRATION[1]
VALUES USED IN LOAD CALCULATIONS

Land use	Event Mean Concentration (mg/L)	
	TN	TP
Open water	1.32	0.1
Developed, open space	2.76	0.39
Developed, Low intensity	3.37	0.42
Developed, Medium intensity	3.15	0.43
Developed, High intensity	2.21	0.31
Barren Land	1.74	0.11
Deciduous Forest	1.74	0.11
Evergreen Forest	1.74	0.11
Mixed Forest	2.32	0.24
Shrub	3.16	0.23
Grassland	3.16	0.23
Pasture/Hay	4.41	1
Cultivated crops	3.57	0.36
Wetlands	1.49	0.135

6 PRISM (PRISM (Parameter-elevation Relationships on Independent Slopes Model) 30-Year Normals, http://prism.nacse.org/normals/

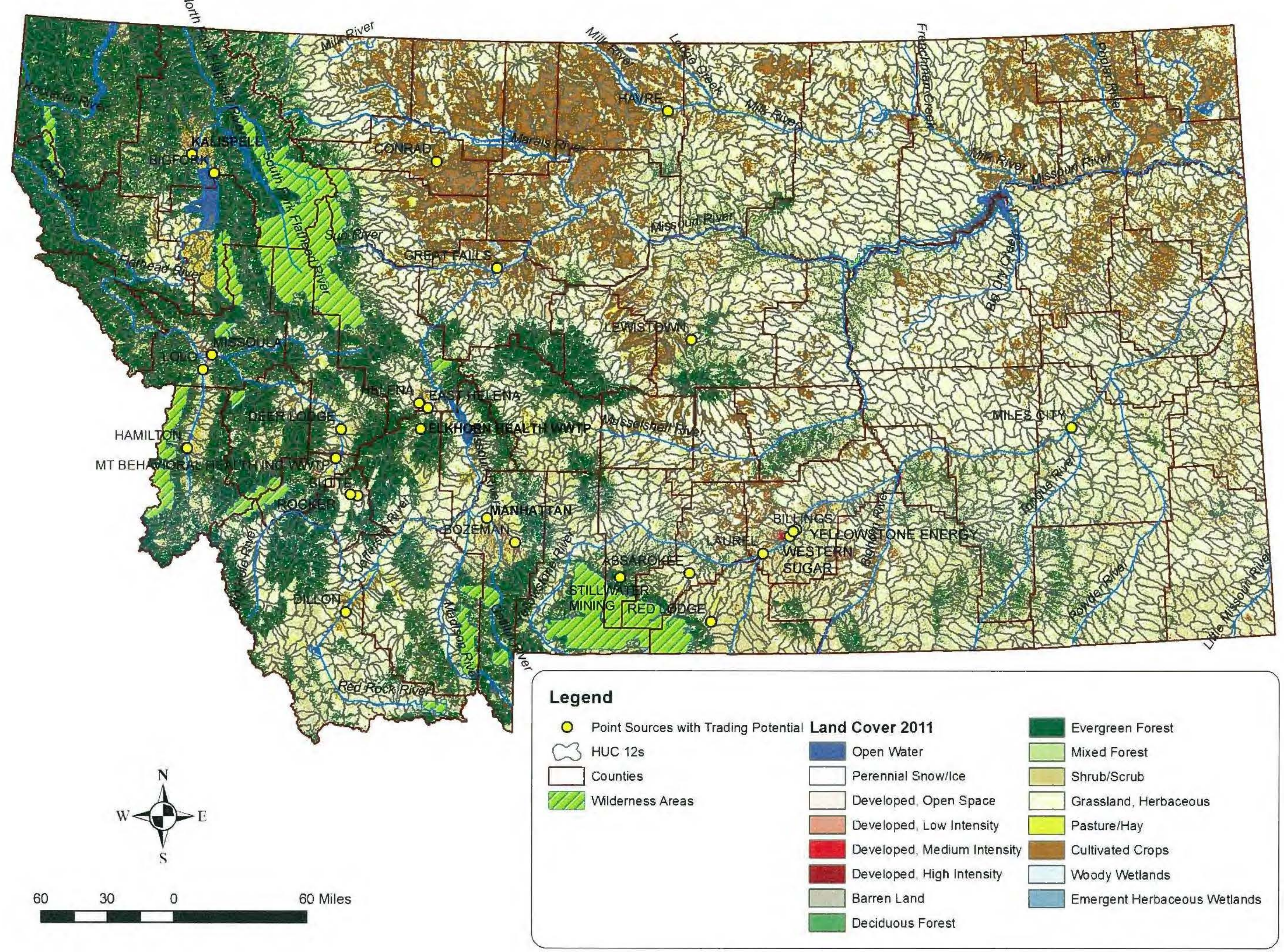
TABLE 4-2
IMPERVIOUSNESS COEFFICIENTS
(USGS, 2014[2]; CAVE ET AL., 1994[3])

Land Use	IMP_L	C_I	C_P
Open water	1	0.95	0.2
Developed, open space	0.05	0.95	0.2
Developed, Low intensity	0.30	0.95	0.2
Developed, Medium intensity	0.65	0.95	0.2
Developed, High intensity	0.90	0.95	0.2
Barren Land	0.05	0.95	0.2
Deciduous Forest	0.05	0.95	0.2
Evergreen Forest	0.05	0.95	0.2
Mixed Forest	0.05	0.95	0.2
Shrub	0.05	0.95	0.2
Grassland	0.05	0.95	0.2
Pasture/Hay	0.05	0.95	0.2
Cultivated crops	0.05	0.95	0.2
Wetlands	1	0.95	0.2

IMP_L = fractional imperviousness off land use

C_I = impervious runoff coefficient

C_P = pervious area runoff coefficient



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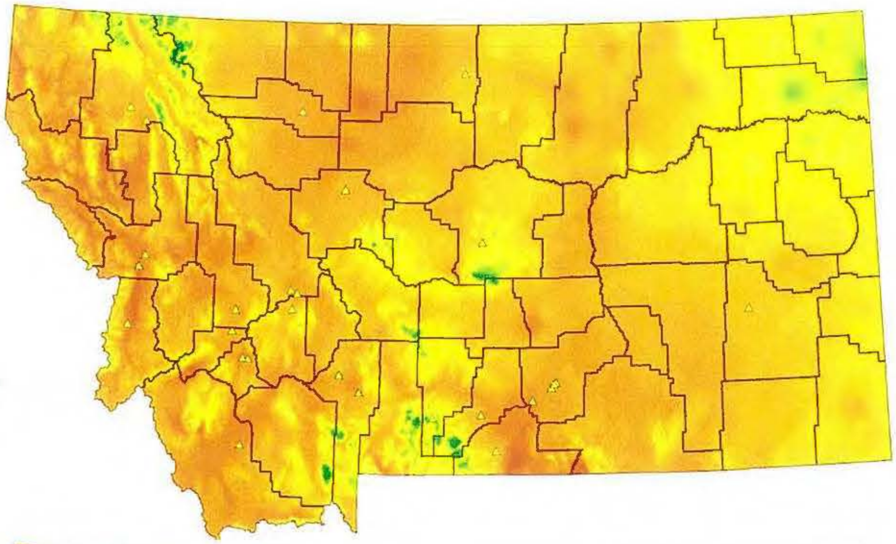

Fig. 4-2a. July

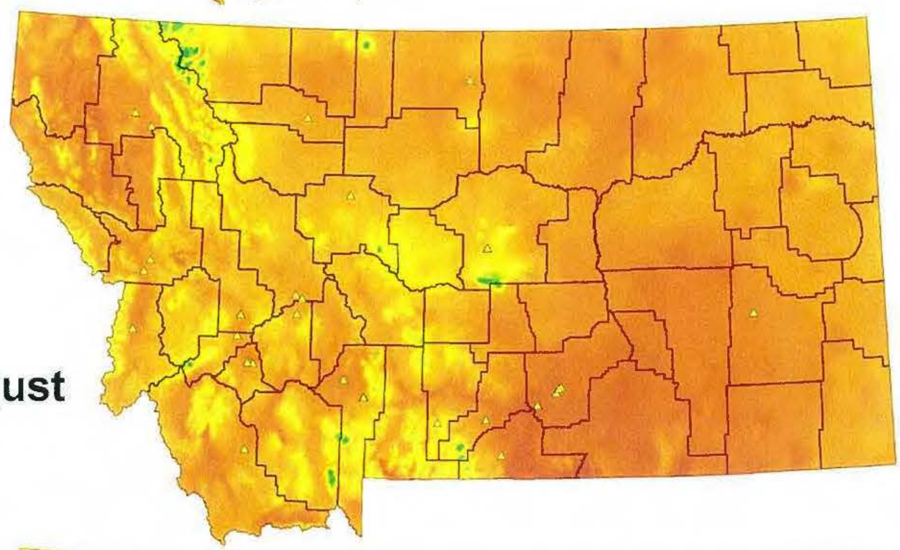

Fig. 4-2b. August

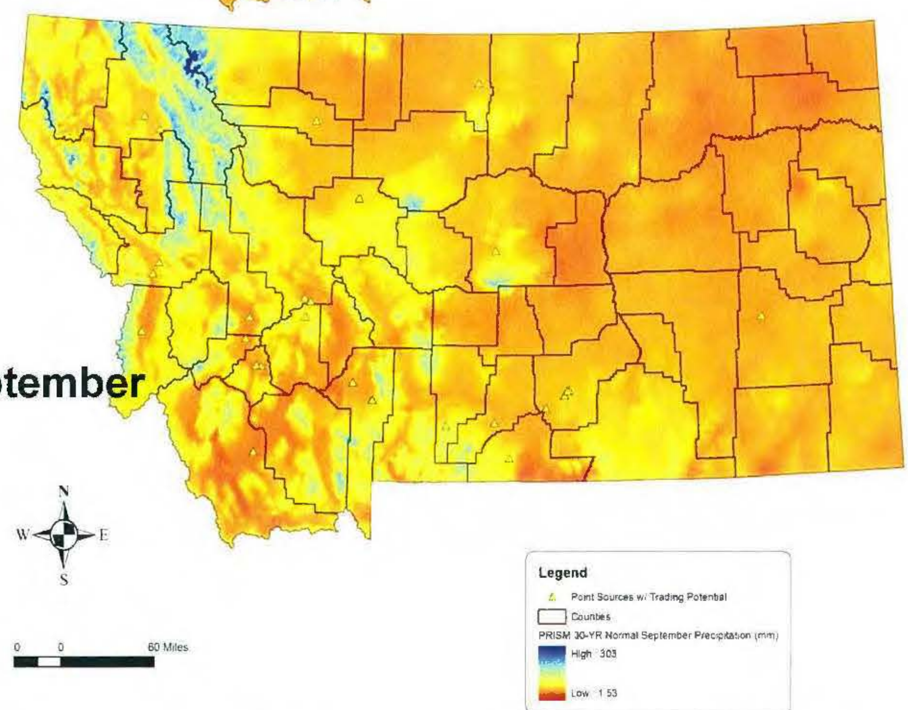

Fig. 4-2c. September

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30-Yr Average Monthly Precipitation (inches) (PRISM data)

PROJECT NO. 4842.006

FIGURE NUMBER 4-2.a-c

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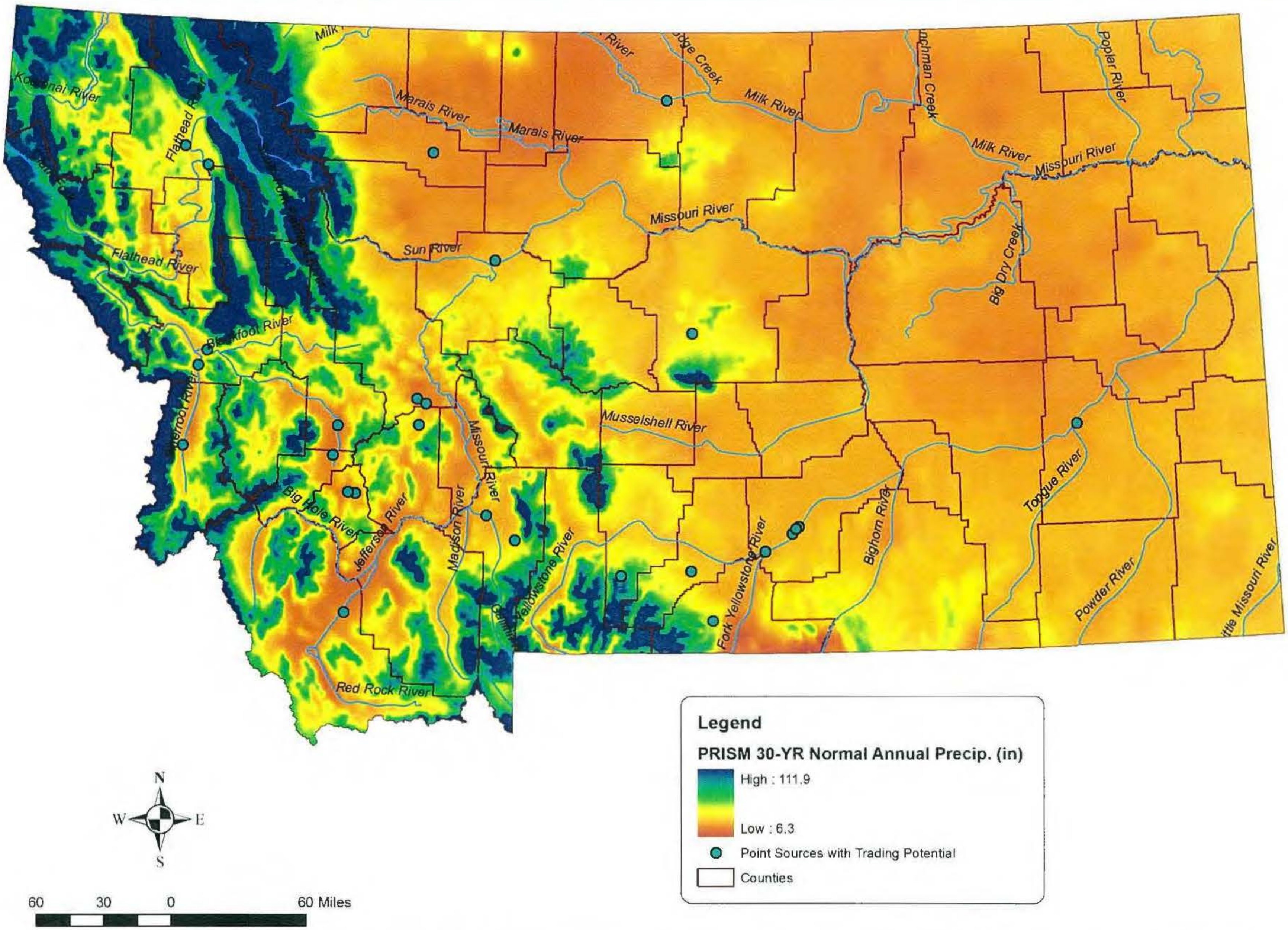

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30-Yr Average Annual Precipitation (inches) (PRISM data)

PROJECT NO. 4842.006

FIGURE NUMBER 4-3

0010869

4.3 Pollutant Load Analysis

Loads from surface runoff were estimated by coupling estimated runoff volumes with EMC data described in the previous section. Runoff is calculated as follows using Equation 1.

$$R_L = [IMP_L \times C_I + (1\text{-}IMP_L) \times C_P)] \times A_L \times I$$

$$= [C_P + (C_I - C_P) \times IMP_L] \times A_L \times I \qquad \text{(Eq. 1)}$$

Where:

R_L	=	Total average annual surface runoff from land use L (acre-inch/month)
C_P	=	Pervious area runoff coefficient (0.20)
C_I	=	Impervious area runoff coefficient (0.95)
IMP_L	=	Fractional imperviousness of land use L
A_L	=	Area of drainage unit (acre)
I	=	Long term average monthly precipitation (inch/month)

The calculated runoff from Equation 1 is used to find the monthly pollutant loads using Equation 2.

$$M_L = EMC_L \times R_L \times K \qquad \text{(Eq. 2)}$$

Where:

M_L	=	Loading factor from land use L (pound/month)
EMC_L	=	Event mean concentration of runoff from land use L (mg/L)
R_L	=	Total average surface runoff from land use L computed in Eq. 1 (acre-inch/month)
K	=	Unit conversion factor of 0.2266

Equation 1 was used to calculate the monthly runoff (R_L) for each land use ($_L$) as the product of the annual rainfall, the area of land use $_L$, the percent imperviousness of land use $_L$, and the default coefficients C_P and C_I. The surface runoff was then multiplied by the respective EMCs and a unit conversion factor to compute the loading factor (M_L), from Equation 2. Monthly results from the three month period of July through September were aggregated to obtain loadings of TP and TN for each of the 4,180 HUC-12 watersheds in the state excluding the designated Wilderness areas.

4.4 Nonpoint Source Nutrient Credit Derivation

Two simple scenarios were applied to preliminarily estimate potential water quality trading credit volume from agricultural and forestry management BMP implementation. It was assumed that BMPs (or a suite of BMPs) with a 50% load reduction efficiency for both TP and TN were applied to 10% and 25% of the agricultural land use (Cultivated Crops, Pasture, and Grassland) areas in each HUC-12 watershed. (Grassland was assumed here to reflect rangeland.) The 10% and 25% values can be regarded as the potential rates of participation by landowners in a trading program. Due to the uncertainties associated with forest BMPs and landowner participation potential, 10% of the evergreen forest land was assumed as the potential credit generation area

0010870

with an 85% load reduction efficiency for TP and 70% for TN, respectively, from this land cover[7]. These reflect BMPs for forest roads.

In both Ag and forestry NPS crediting applications, we do not assume where BMPs would be applied. Rather, the assumption is that BMPs are applied where they do not already exist. This portends the need for on-the-ground technical assistance in finding sites for actual trades. BMP assumptions are discussed further is Section 5 under credit costs while Section 6 discusses the trading framework to accommodate technical needs for trading.

Water quality trading in Montana usually typically requires that credits be generated upstream of the buyer; downstream credit generation may be considered on a case-by-case basis in the trading policy. Credits from NPS runoff reductions above PSs were only considered in this application. This was considered sufficient for to address nutrient losses downstream due to fate and transport processes in delivery of credits to the buyer location. Factors to estimate loading reductions attributed to fate and transport are often included as a part of the trading ratios. These ratios can also account for uncertainty, net environmental benefits to the river and pollutant equivalency. For this analysis, a commonly used trading ratio of 2:1 was used to simplify assumptions that otherwise would require specific knowledge of NPS crediting projects and locations. This trading ratio means that for every two pounds of load reduction achieved by a NPS, only one pound can be used as credit for point sources in trading.

4.5 Nonpoint Source Credit Supply

Land cover loading data (provided electronically and separate from this report) and modified as noted above (participation rates, BMPs efficiencies and 2:1 trade ratio), yielded seasonal (July – September) credit values as shown in Table 4-3 for TN and TP. The table includes the number of HUC-12s upstream of these PSs that would be available to provide credits. In watersheds with multiple PSs, these are presented in an upstream to downstream order.

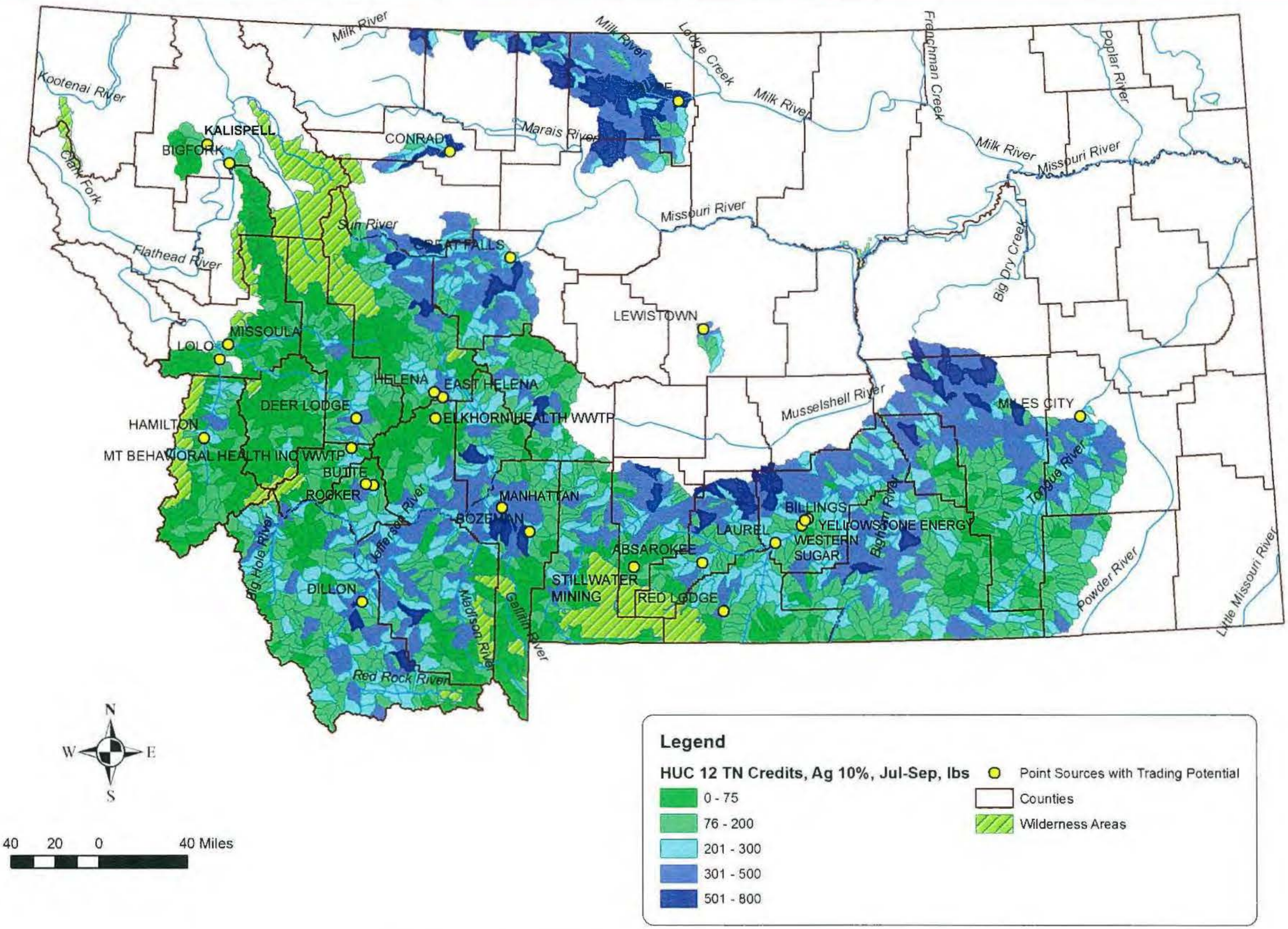
[7] National Level Assessment of Water Quality Impairments Related to Forest Roads and Their Prevention by Best Management Practices - Final Report, Prepared by: Great Lakes Environmental Center for: U.S. Environmental Protection Agency Office of Water, Contract No. EP-C-05-066, December 2008.
Task Order 002

TABLE 4-3
TN AND TP CREDITS UPSTREAM OF POINT SOURCES
(IN WATERSHEDS WITH MULTIPLE SOURCES; UPSTREAM TO DOWNSTREAM)

			Total Nitrogen			Total Phosphorus		
NPDES #	Facility Name	Number of All Upstream HUC-12s	10%Total Upstream Ag Credit Supply (lbs/season)	25% Total Upstream Ag Credit Supply (lbs/season)	10% Total Upstream Forestry Credit Supply (lbs/season)	10%Total Upstream Ag Credit Supply (lbs/season)	25% Total Upstream Ag Credit Supply (lbs/season)	10% Total Upstream Forestry Credit Supply (lbs/season)
Yellowstone River								
MT0026808	Stillwater Mining Company - East Boulder	1	63	158	524	5	12	40
MT0021750	Absarokee	8	942	2,356	531	100	251	41
MT0020478	Red Lodge	5	160	400	532	12	30	41
MT0020311	Laurel	213	31,671	79,176	14,205	3,009	7,523	1,090
MT0000281	Western Sugar Cooperative	224	33,786	84,464	14,315	3,201	8,004	1,099
MT0022586	Billings	226	34,077	85,193	14,337	3,224	8,061	1,101
MT0030180	Yellowstone Energy Limited Partnership Facility	227	34,258	85,645	14,378	3,242	8,106	1,104
MT0020001	Miles City	692	133,220	333,049	27,503	11,091	27,729	2,111
Missouri River								
MT0021458	Dillon	102	17,932	44,831	5,228	1,533	3,832	401
MT0022608	Bozeman	8	1,072	2,681	1,571	138	345	121
MT0021857	Manhattan	51	6,971	17,427	7,939	922	2,305	609
MT0023566	Elkhorn Health Care WWTP	4	178	445	665	14	35	51
MT0022560	East Helena	9	616	1,539	1,691	51	127	130
MT0022641	Helena	10	643	1,608	1,826	53	132	140
MT0021920	Great Falls	692	118,479	296,197	68,313	10,997	27,493	5,244
Clark Fork								
MT0027430	Rocker	4	495	1,236	516	39	98	40
MT0022012	Butte	4	495	1,236	516	39	98	40
MT0021431	MT Behavioral Health Inc WWTP	23	2,507	6,267	3,254	243	607	250
MT0022616	Deer Lodge	32	4,161	10,401	4,759	448	1,120	365
MT0022594	Missoula	221	14,832	37,079	32,716	1,541	3,853	2,511
Bitterroot River								
MT0020028	Hamilton	52	2,806	7,015	8,709	275	687	669
MT0020168	Lolo	84	4,963	12,408	12,920	580	1,450	992
Milk River								
MT0022535	Havre	80	30,886	77,214	439	2,883	7,207	34
Big Spring Creek								
MT0020044	Lewiston	5	1,000	2,500	593	114	285	46
Dry Fork Marias River								
MT0020079	Conrad	10	3,286	8,216	14	299	747	1
Flathead Lake								
MT0020397	Bigfork	23	731	1,827	5,693	112	280	437
Ashley Creek								
MT0021938	Kalispell	7	331	828	1,542	42	105	118

To graphically illustrate these estimates, Figures 4-4 through 4-7 present supply in relation to each PS in corresponding to TN and TP for Ag (at 10% participation) and TN and TP for forestry (also assuming 10% of the evergreen forest roads receive management), respectively. These figures illustrate fairly clear opportunities for credit generation between Ag land covers and forestry reflecting supplies denoted in Table 4-3. One of the more obvious examples of this credit distribution is in the Milk River Basin above the City of Havre in north central Montana.

These calculated credits and their distribution are used for assessing potential volume of NPS credits to meet PS demand in Section 5. Such estimates are then be used to determine whether these would be cost-effective for point source compliance in comparison to wastewater treatment plant upgrade costs to meet compliance with variance limits for TN and TP. These cost comparisons are also presented in Section 5.



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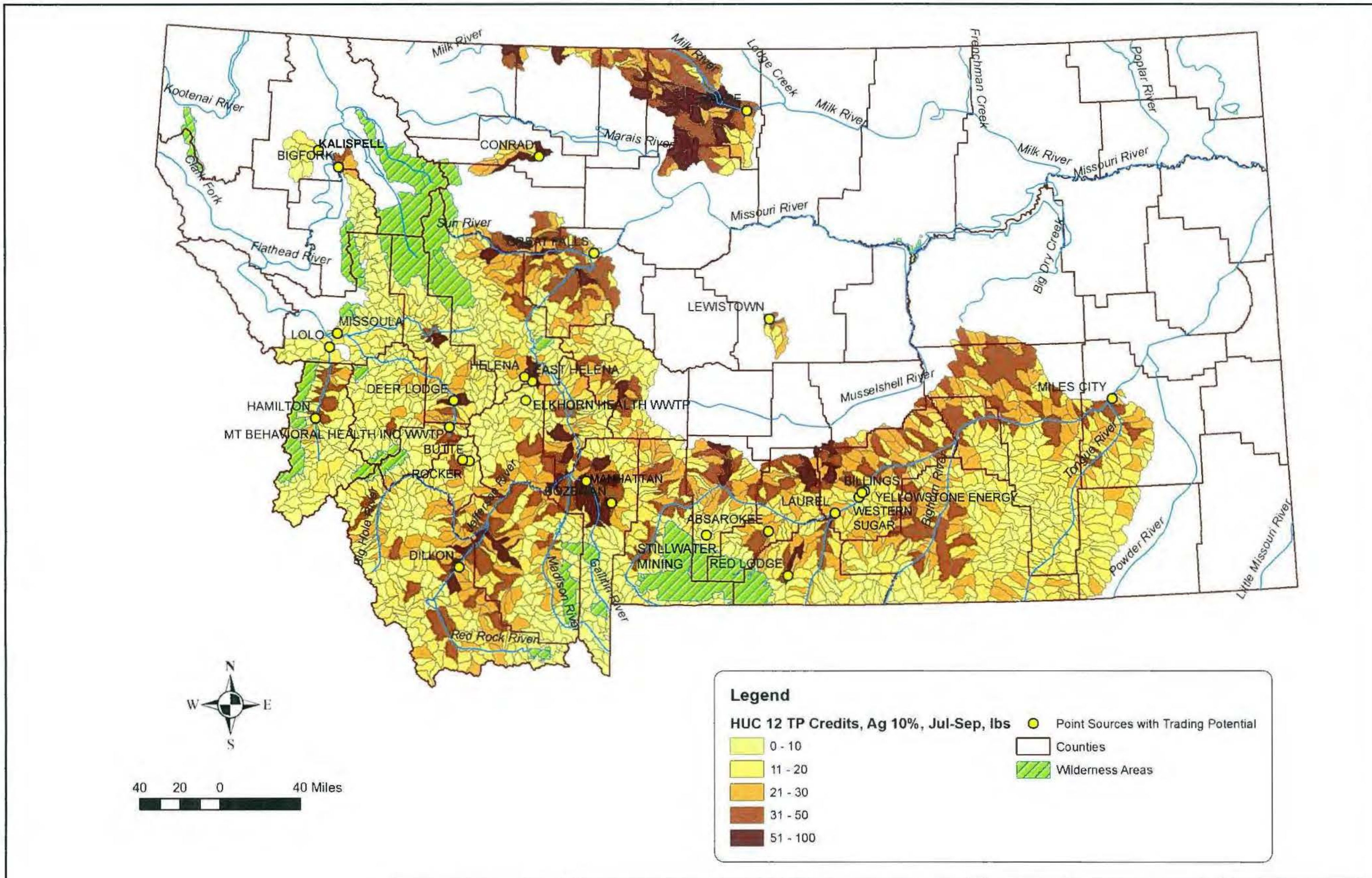
July-September TN Ag Credits With 10% Farmer Participation

PROJECT NO. 4842.006

0010873

FIGURE NUMBER 4-4



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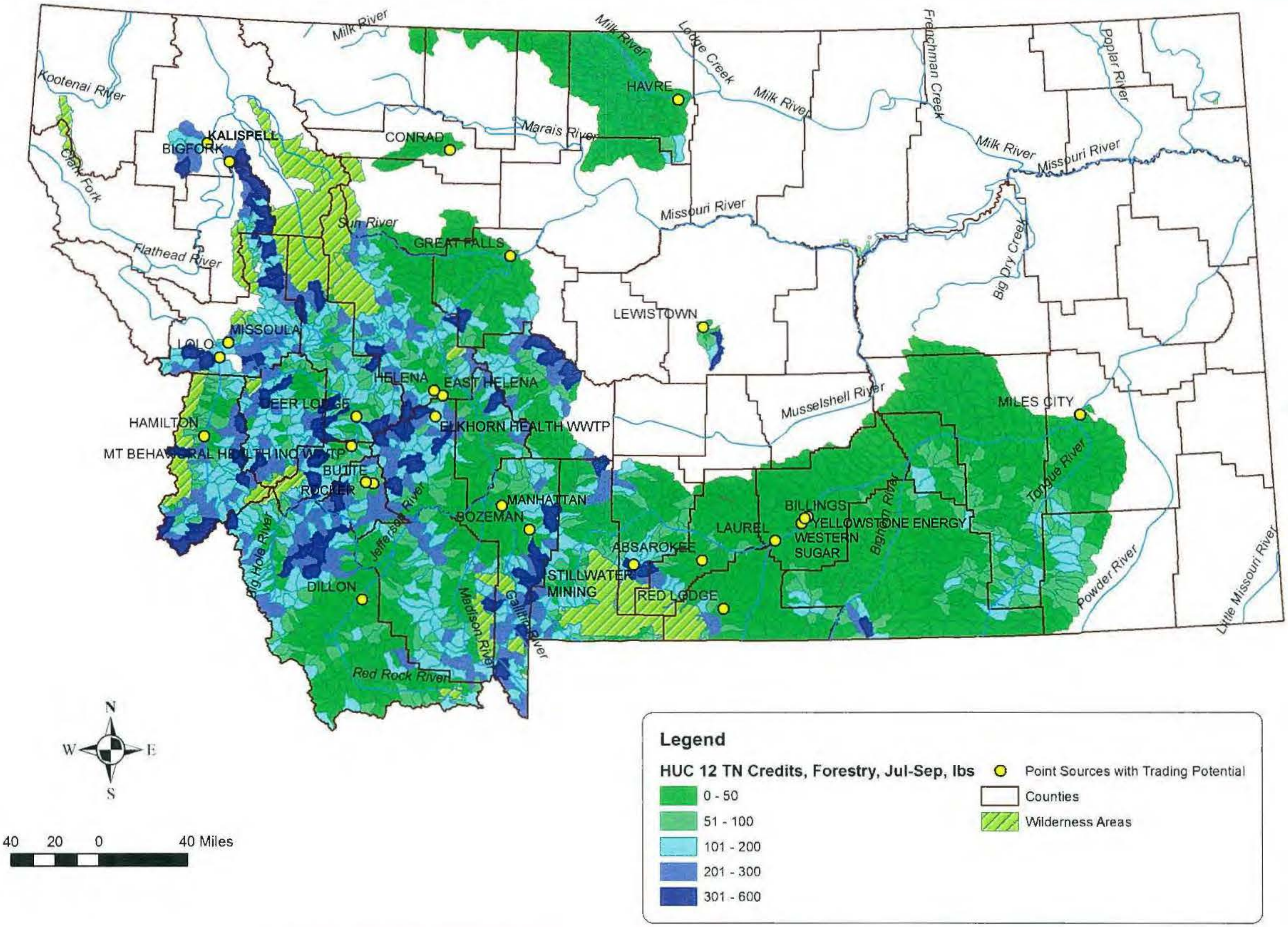
July-September TP Ag Credits
With 10% Farmer Participation

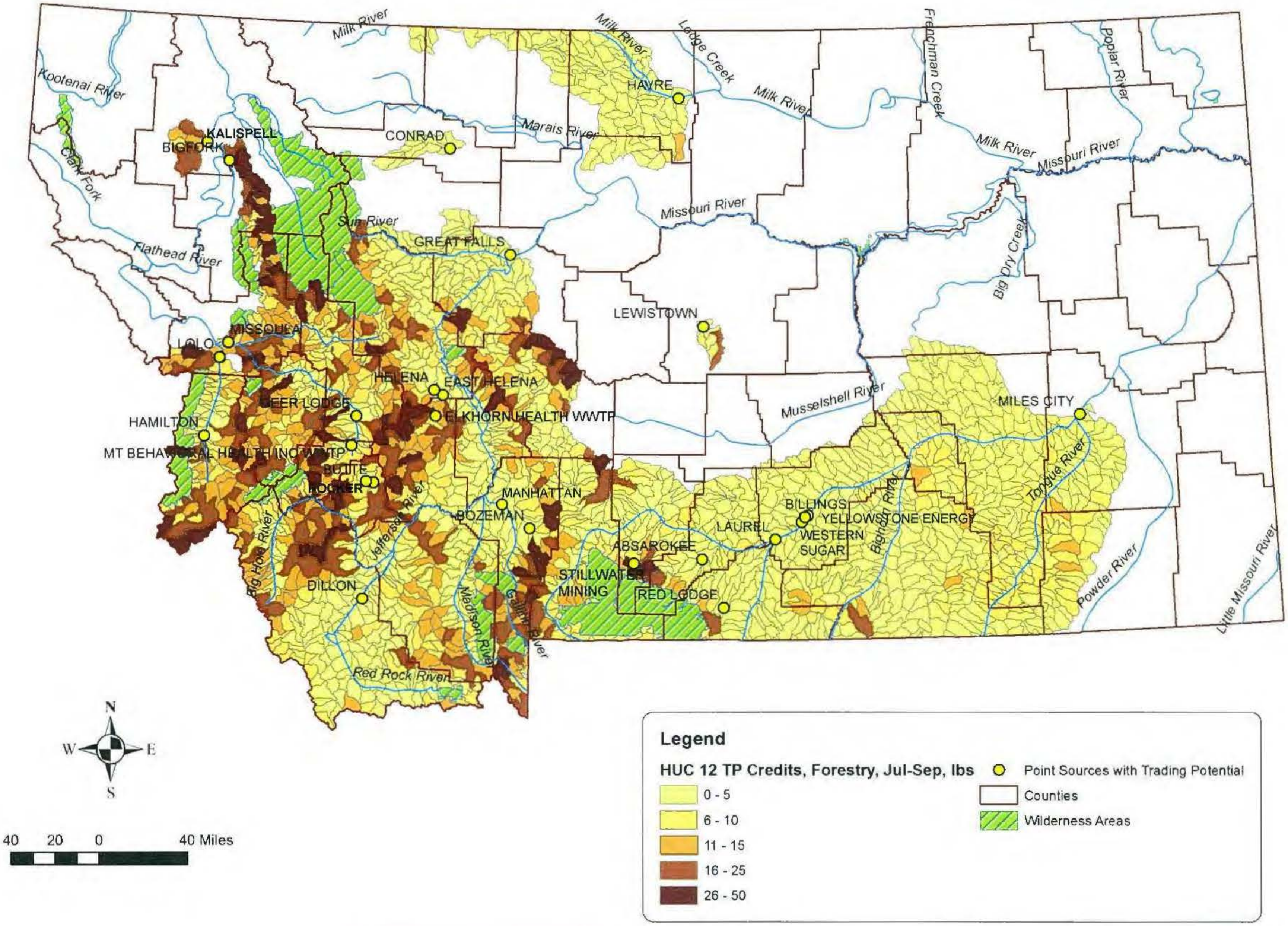
PROJECT NO.
4842.006

0010874

FIGURE NUMBER
4-5



MORRISON MAIERLE, INC. An Employee-Owned Company 1 Engineering Place, Helena MT 59602 Phone: (406) 442-3050 Fax: (406) 442-7862	KIESER & ASSOCIATES ENVIRONMENTAL SCIENCE & ENGINEERING 536 East Michigan Avenue, Suite 300 Kalamazoo, MI 49007 USA Phone: (269) 344-7117	July-September TN Forestry Credits at 10% of Evergreen Land Cover 0010875	PROJECT NO. 4842.006 FIGURE NUMBER 4-6



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July-September TP Forestry Credits at 10% of Evergreen Land Cover

PROJECT NO.
4842.006

0010876

FIGURE NUMBER
4-7

4.6 Septic System Supply Assessment

A preliminary evaluation of potential nitrogen offset supply was conducted for six of the larger municipal settings where septic system disconnect program opportunities may exist. Table 4-4 illustrates the number of potential opportunities and potential seasonal nitrogen reduction benefits using the Montana trading policy calculation method. Figures 4-8 through 4-13 illustrate growth boundaries and locations of septic systems for these six municipalities where disconnects may be possible. Estimates for septic system disconnects may be between $3,000 to $5,000. Using the lower figure of $3,000, this results in a cost of $1,667 per pound of TN. The credit value of 0.02 lbs/day per septic tank used in Table 4-4 is based on typical nitrogen loads to septic tanks and is equivalent to a trade ratio of 4:1, which is based on generalized averages where septic trading ratios have been calculated for a few municipalities in Montana using the method described in DEQ Circular 13. The value of 0.006 lbs/days per septic tank used for Missoula is based on the septic trading analysis completed specifically for the Missoula draft wastewater discharge permit.

TABLE 4-4
SEPTIC TANK NITROGEN CREDITS AVAILABLE WITHIN GROWTH BOUNDARY

City	Septic Tanks within Growth Boundary	Approximate Nitrogen Credits (lbs/season)*	Nitrogen Demand (lbs/season)**	Percent of Demand Met if all Septic Tanks are Connected
Billings	6,070	10,926	24,056	45%
Bozeman	1,554	2,797	2,651	106%
Great Falls	3,245	5,841	15,931	37%
Helena***	1,239	2,230	1,219	183%
Kalispell	5,528	9,950	4,516	220%
Missoula****	5,165	2,789	18,558	15%

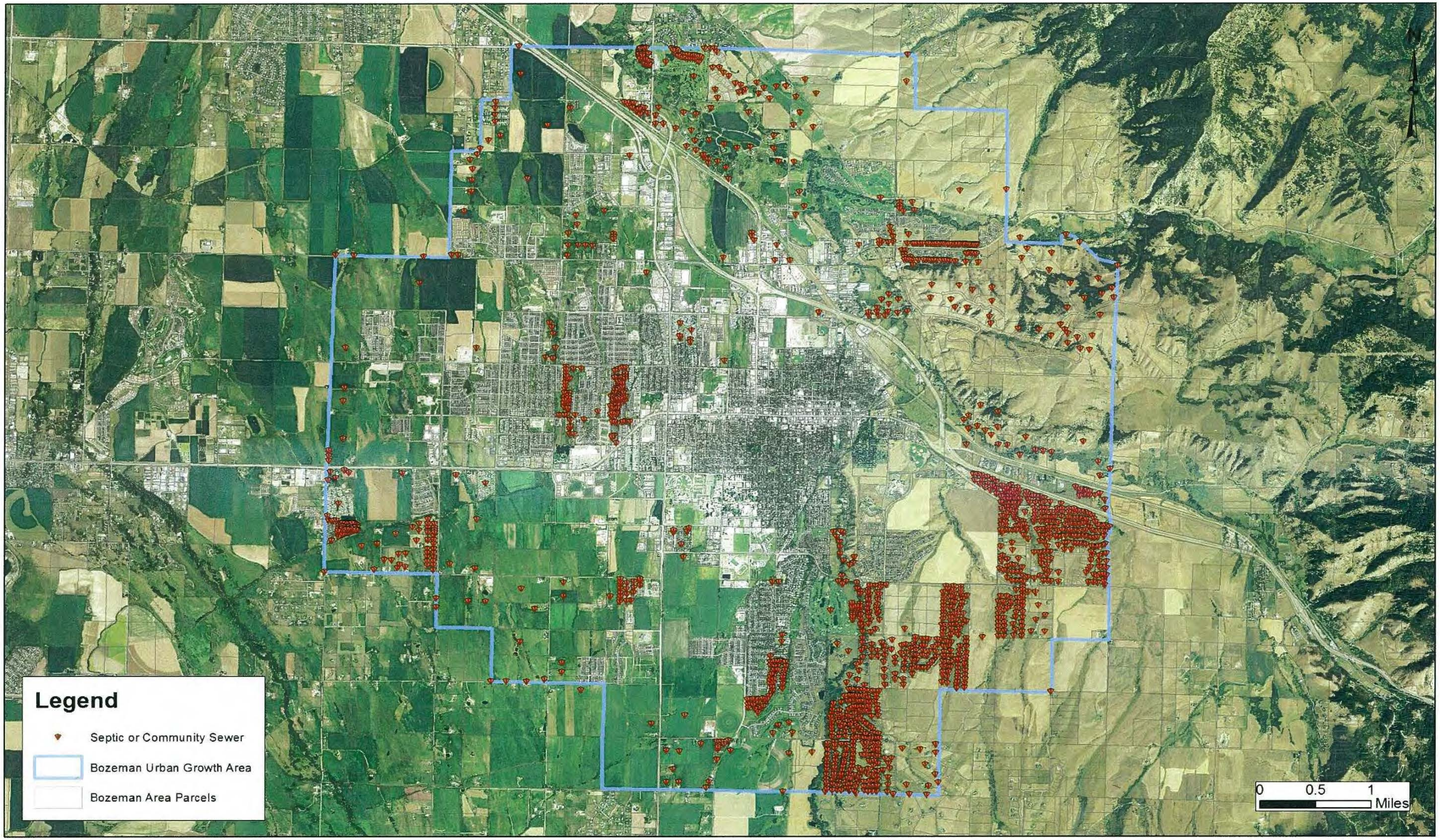
*Assuming 0.02 lbs/day of TN credit per septic tank, season assumed to be 90 days

**From the Demand Calculations: Demand after the 4th Permit Cycle

***The Helena Growth Boundary is not an adopted annexation plan, just an estimation of the area that could be annexed without requiring major infrastructure improvements

****This assumes Missoula has already met its obligation under the VNRP TMDL

****For Missoula, 0.006 lbs/day of TN credit per septic tanks was used, consistent with their permit



Bozeman Population (2012): 38,695
Septic Tanks in Growth Boundary: 1,554

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		Septic Tanks in Growth Boundary	FIGURE NUMBER 4-8

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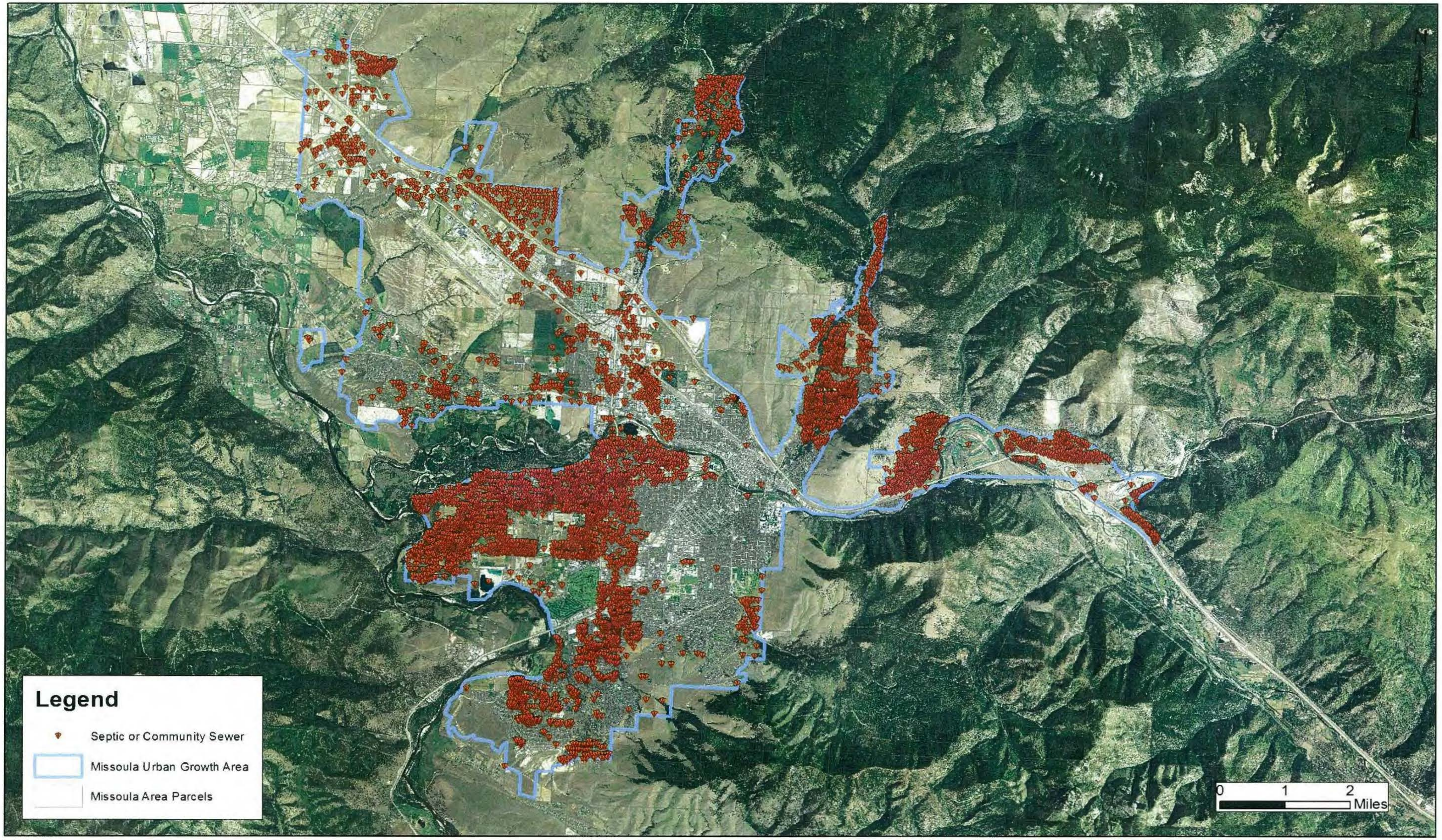

Missoula Population (2012): 68,394
Septic Tanks in Growth Boundary: 5,165

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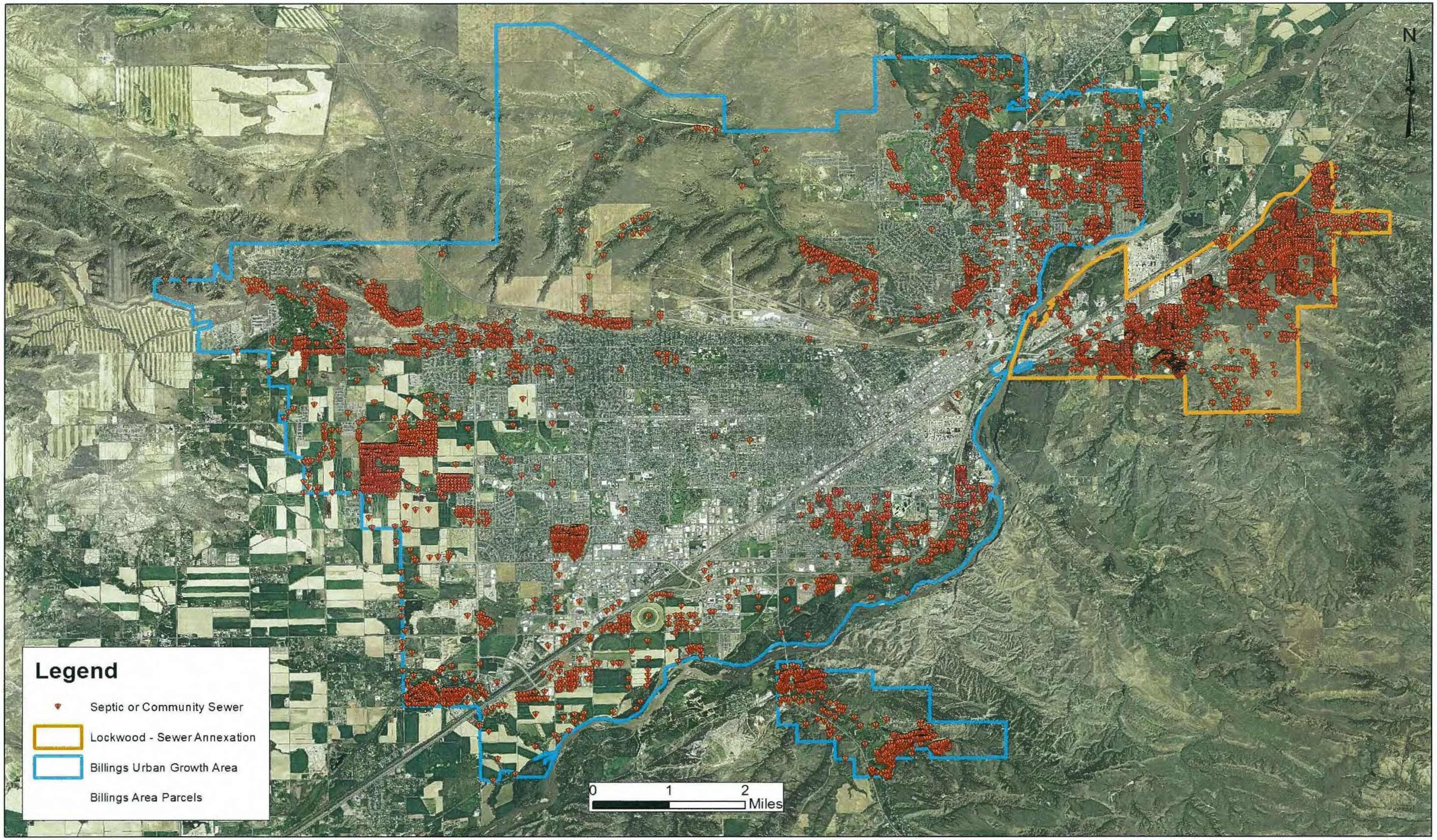

Billings and Lockwood Population (2012): 113,751
Septic Tanks in Growth Boundary: 6,070

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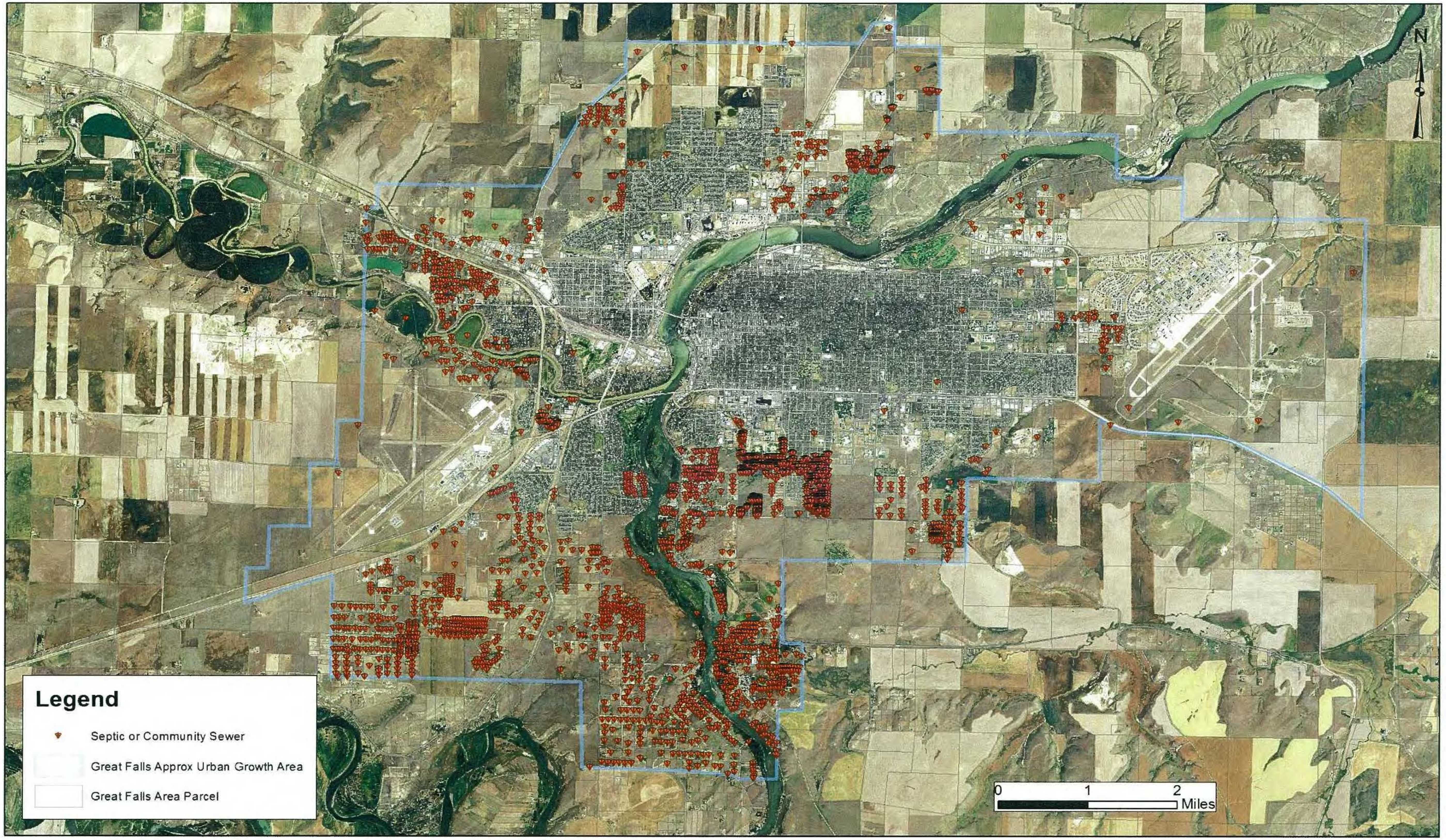
		Septic Tanks in Growth Boundary	FIGURE NUMBER 4-10



Great Falls Population (2012): 58,893
Septic Tanks in Growth Boundary: 3,245

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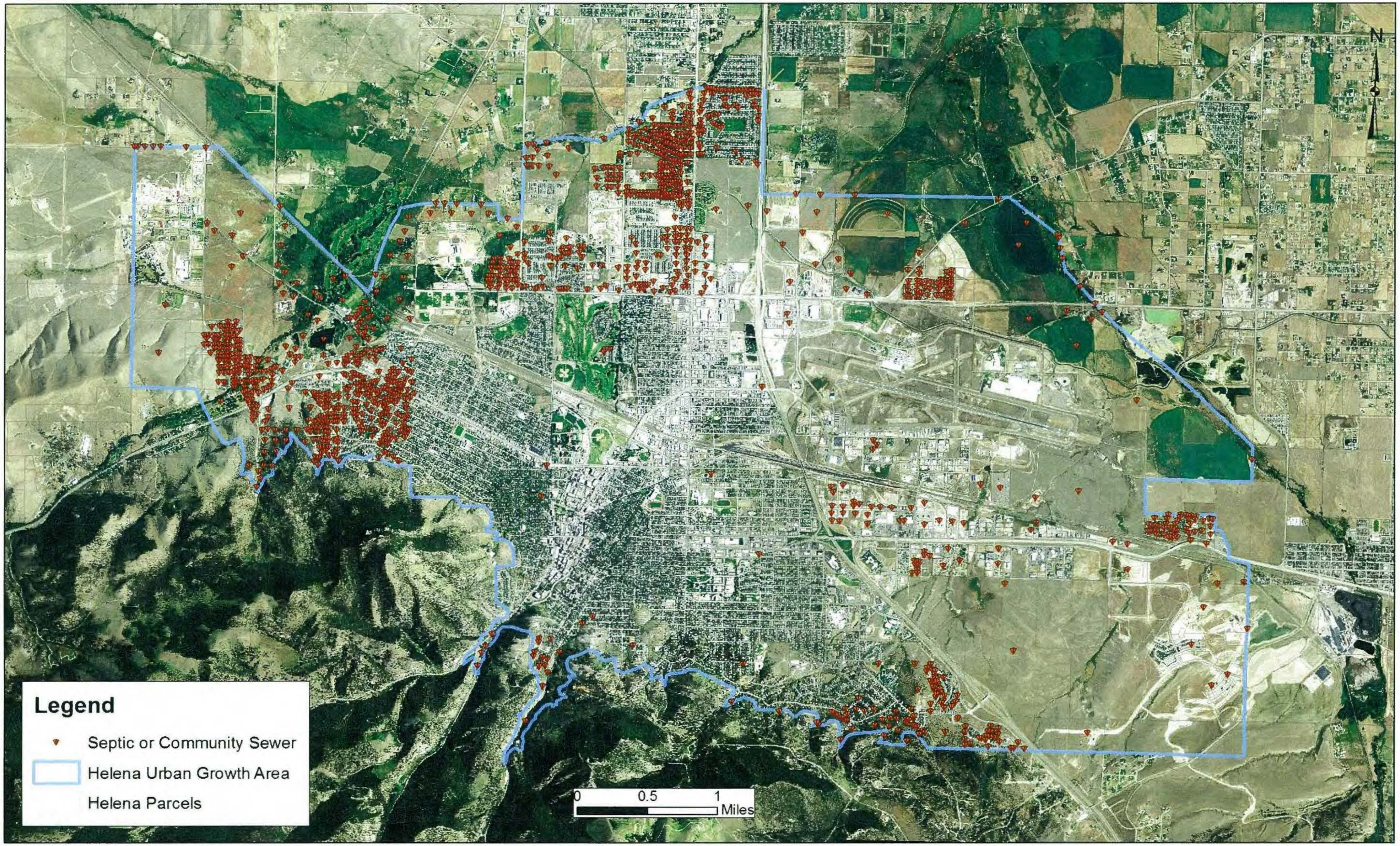
			Septic Tanks in Growth Boundary	FIGURE NUMBER 4-11



Helena Population (2012): 28,381

Septic Tanks in Growth Boundary: 1,239

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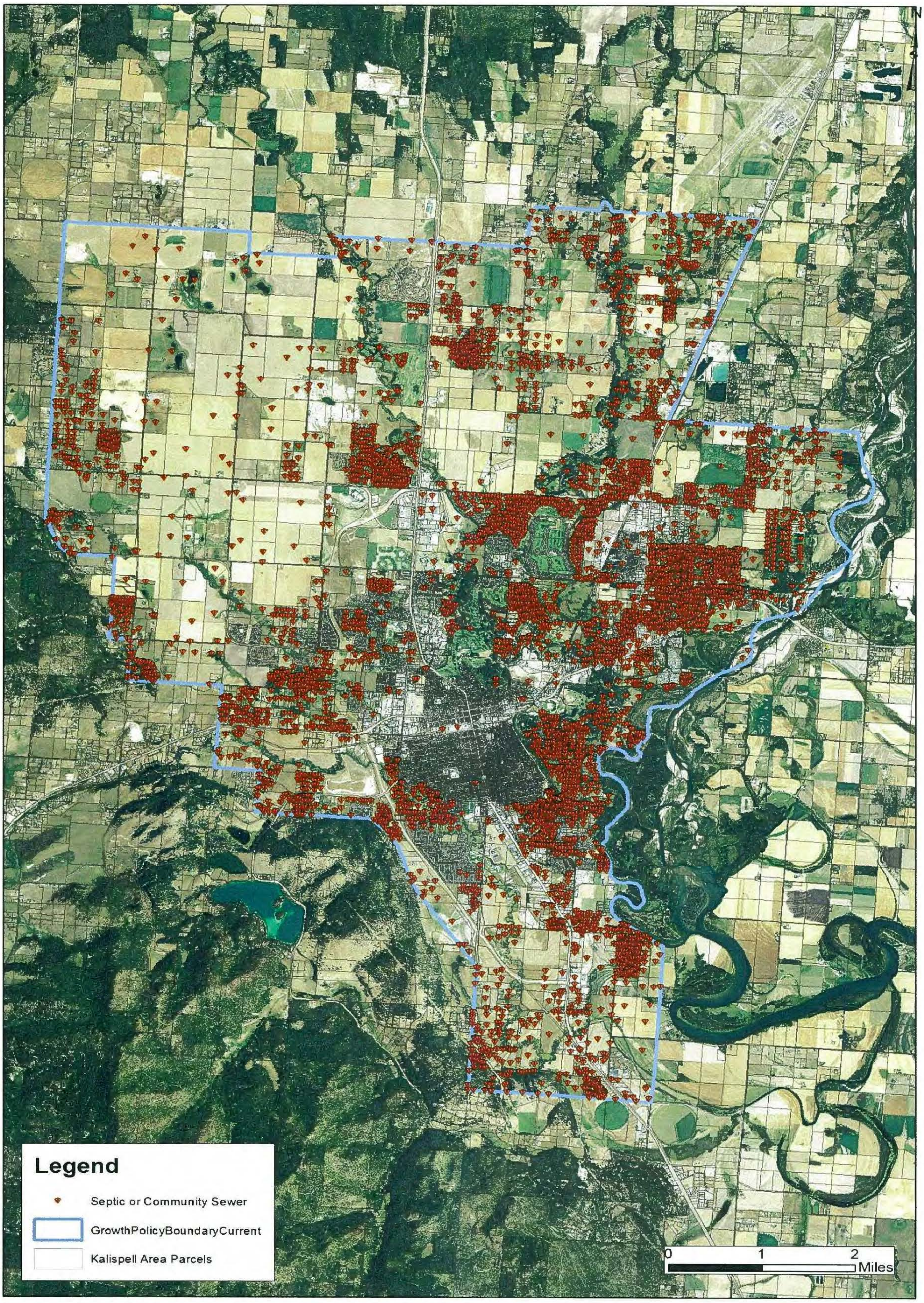
			Septic Tanks in Growth Boundary	FIGURE NUMBER 4-12



Kalispell Population (2012): 20,016
Septic Tanks in Growth Boundary: 5,528

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		Septic Tanks in Growth Boundary	FIGURE NUMBER 4-13

5.0 COMPARISON OF DEMAND AND SUPPLY

5.1 Overview

Evaluating the viability of a trading market is based on: 1) the determination of whether there is ample credit supply from NPSs to meet the demand of PSs, and 2) whether there are substantial cost savings with trading versus WWTP upgrades. This section presents the results of comparing Section 3 WWTP demand and Section 4 NPS credit supply in these regards. Credit supply comparisons are presented first, followed by a more detailed example of the demand/supply comparison for Miles City to illustrate trading considerations with NPSs. Cost comparisons conclude the section. The overall demand/supply results presented here are the basis for Section 6 recommendations for the Montana business case for trading, future MDEQ investments costs and related considerations.

5.2 Demand and Supply Comparisons

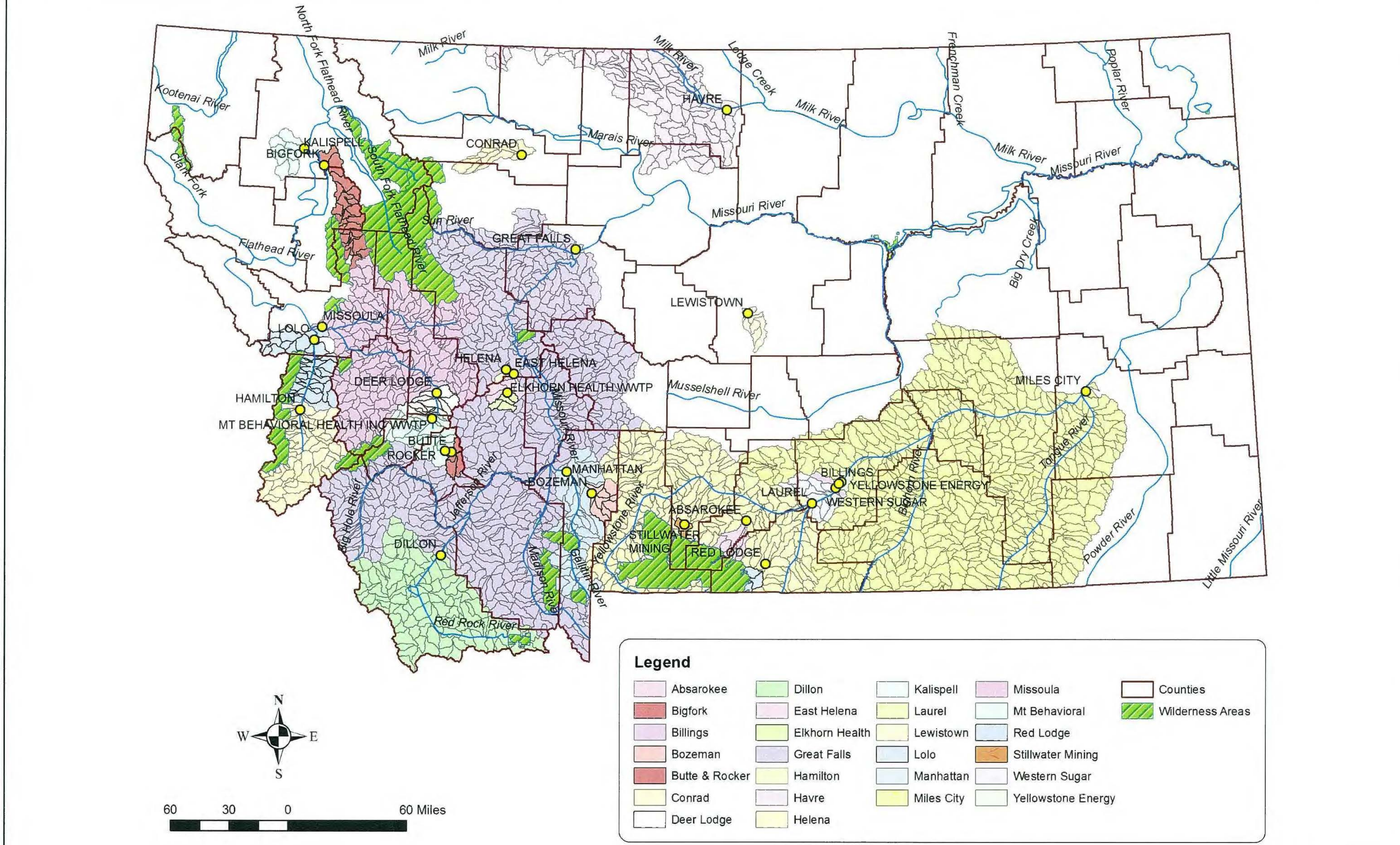
Montana trading policy usually requires buyers to purchase credits from upstream sellers. For the 27 PSs that were identified is Section 3 for having the potential to trade, upstream HUC-12 watersheds were delineated. These are illustrated for each facility in Figure 5-1 (color-coding is solely to help illustrate corresponding upstream areas for trading supply).

Tables 5-1 and 5-2 present a comparison of PS credit demand from the 27 targeted PSs with results of the credit supply analysis for potential TN and TP credits (from Section 4), respectively. Supply estimates are derived from theoretical NPS conservation actions in agriculture and forestry. TN and TP demand in Tables 5-1 and 5-2, respectively is presented as the most conservative (maximum demand) scenario that would occur in the fourth permit cycle examined in this study. The corresponding dates for these permit cycles are also included in these tables. Such information was extracted from Table 3-1 of this report. PSs in Tables 5-1 and 5-2 are clustered by watershed to best illustrate where about 80% of these point sources share overlapping upstream areas from which, at some level, they will need to derive credits.

As most upstream watershed areas above PSs are relatively large in Montana, the Project Team assumed here that it is most likely that credit buyers will first seek credits from upstream HUC-12s in close proximity to many of the discharges. This will reduce the need for high trade ratios that might otherwise require discounting for far upstream credits. This will also facilitate local credit exchanges through local contacts and community connections with rural areas.

As such, credit supply presented in Tables 5-1 and 5-2 first reflects scenarios with credits provided by upstream HUC-12s that could only produce credits for their location. These are referred to as "Exclusive" HUC-12s whereby none of the other 26 PSs that might look to trading in this study could obtain credits. (These are illustrated with color-coding in Figure 5-1.) This approach not only simplifies the demand/supply comparisons, it also portends that in many cases examined herein, credit competition will likely not be a substantial concern in the trading marketplace for these facilities. If exclusive credit supply is insufficient for demand, credit supply from all upstream areas is also considered (minus that already exclusively allocated to other upstream PSs).

A hypothetical trade scenario for Miles City, presented later in this section, will illustrate how buyers might more readily seek closer proximity credit opportunities in these exclusive upstream HUC-12s. For example, despite the fact that Miles City would still have a substantial portion of 692 upstream HUC-12s in the Yellowstone Basin (e.g., Table 5-1) to produce credits, logistics and administrative costs might dictate trying to find credits in more immediate areas of theirs and an adjacent, upstream county.



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Potential WWTPs for WQT with Exclusive Upstream HUC-12 Credit Supply

PROJECT NO. 4842.006

FIGURE NUMBER 5-1

0010885

TABLE 5-1
TOTAL NITROGEN UPSTREAM CREDIT AVAILABILITY
UPSTREAM TO DOWNSTREAM PS DISTRIBUTION IN WATERSHEDS WITH MULTIPLE SOURCES

		WWTP TN Credit Demand		SCENARIO #1 Exclusive Upstream Ag Credit Supply (10% Participation)			SCENARIO #2 Exclusive Upstream Ag Credit Supply (25% Participation)		SCENARIO #3 Exclusive Upstream Ag Supply (25% Participation) plus Forest Credit Supply			SCENARIO #4 Total Upstream Ag Credit Supply (10% Participation)				SCENARIO #5 Total Upstream Ag Supply (25% Participation) plus Forest Credit Supply				Total Available Supply
NPDES #	**Facility Name**	Highest Potenial Demand (lbs/season)	Highest Demand Permit Cycle (Date)	Number of Exclusive Upstream HUC-12s	Exclusive Upstream Ag Credit Supply (lbs/season)	Credit Supply Meets Demand? (Y/N)	Exclusive Upstream Ag Credit Supply (lbs/season)	Credit Supply Meets Demand? (Y/N)	Exclusive Upstream Forest Credit Supply (lbs/season)	Exclusive Upstream Ag plus Forest Credit Supply (lbs/season)	Credit Supply Meets Demand? (Y/N)	Number of All Upstream HUC-12s	Total Upstream Ag Credit Supply (lbs/season)	Total Upstream Ag Credit Supply Minus Total Upstream Demand (lbs/season)	Credit Supply Meets Demand? (Y/N)	Total Upstream Ag Credit Supply (lbs/season)	Total Upstream Forestry Credit Supply (lbs/season)	Total Upstream Ag and Forestry Credits minus Total Upstream Demand (lbs/season)	Credit Supply Meets Demand? (Y/N)	Credit Supply Meets Demand? (Y/N)
Yellowstone River																				
MT0026808	Stillwater Mining Company - East Boulder	0	2/1/2030	1	63	Y														Y
MT0021750	Absarokee	1,387	2/1/2035	8	942	N	2,356	Y												Y
MT0020478	Red Lodge	3,055	7/2/2035	5	160	N	400	N	532	933	N	5	160	160	N	400	532	933	N	N
MT0020311	Laurel	0	8/1/2030	204	30,665	Y														Y
MT0000281	Western Sugar Cooperative	3,140	1/1/2030	11	2,115	N	5,287	Y												Y
MT0022586	Billings	24,056	11/1/2034	2	292	N	729	N	22	751	N	226	34,077	26,495	Y					Y
MT0030180	Yellowstone Energy Limited Partnership Facility	0	5/1/2034	1	181	Y														Y
MT0020001	Miles City	15,932	4/1/2031	465	98,962	Y														Y
Missouri River																				
MT0021458	Dillon	6,901	3/1/2030	102	17,932	Y														Y
MT0022608	Bozeman	2,651	6/1/2032	8	1,072	N	2,681	Y												Y
MT0021857	Manhattan	263	9/1/2030	43	5,898	Y														Y
MT0023566	Elkhorn Health Care WWTP	42	2/1/2030	4	178	Y														Y
MT0022560	East Helena	2,004	3/1/2030	5	437	N	1,094	N	1,026	2,119	Y									Y
MT0022641	Helena	1,219	10/1/2032	1	27	N	69	N	135	204	N	10	643	-1,403	N	1,608	1,826	1,387	Y	Y
MT0021920	Great Falls	15,931	12/1/2030	508	91,067	Y														Y
Clark Fork																				
MT0027430	Rocker	177	6/1/2033	4	495	Y														Y
MT0022012	Butte	0	4/1/2032	4	495	Y														Y
MT0021431	MT Behavioral Health Inc WWTP	67	8/1/2032	19	2,012	Y														Y
MT0022616	Deer Lodge	101	3/1/2033	9	1,654	Y														Y
MT0022594	Missoula	18,558	3/1/2030	189	10,671	N	26,678	Y												Y
Bitterroot River																				
MT0020028	Hamilton	0	9/1/2031	52	2,806	Y														Y
MT0020168	Lolo	2,884	9/1/2034	32	2,157	N	5,393	Y												Y
Milk River																				
MT0022535	Havre	2,469	5/1/2031	80	30,886	Y														Y
Big Spring Creek																				
MT0020044	Lewiston	0	9/1/2032	5	1,000	Y														Y
Dry Fork Marias River																				
MT0020079	Conrad	1,126	2/1/2032	10	3,286	Y														Y
Flathead Lake																				
MT0020397	Bigfork	981	8/1/2030	23	731	N	1,827	Y												Y
Ashley Creek																				
MT0021938	Kalispell	4,516	6/1/2030	7	331	N	828	N	1,542	2,370	N	7	331	331	N	828	1,542	2,370	N	N

TABLE 5-2
TOTAL PHOSPHORUS UPSTREAM CREDIT AVAILABILITY
UPSTREAM TO DOWNSTREAM PS DISTRIBUTION IN WATERSHEDS WITH MULTIPLE SOURCES

		WWTP TP Credit Demand		SCENARIO #1 Exclusive Upstream Ag Credit Supply (10% Participation)			SCENARIO #2 Exclusive Upstream Ag Credit Supply (25% Participation)		SCENARIO #3 Exclusive Upstream Ag Supply (25% Participation) plus Forest Credit Supply			SCENARIO #4 Total Upstream Ag Credit Supply (10% Participation)				SCENARIO #5 Total Upstream Ag Supply (25% Participation) plus Forest Credit Supply				Total Available Supply
NPDES #	Facility Name	Highest Potenial Demand (lbs/season)	Highest Demand Permit Cycle (Date)	Number of Exclusive Upstream HUC-12s	Exclusive Upstream Ag Credit Supply (lbs/season)	Credit Supply Meets Demand? (Y/N)	Exclusive Upstream Ag Credit Supply (lbs/season)	Credit Supply Meets Demand? (Y/N)	Exclusive Upstream Forest Credit Supply (lbs/season)	Exclusive Upstream Ag plus Forest Credit Supply (lbs/season)	Credit Supply Meets Demand? (Y/N)	Number of All Upstream HUC-12s	Total Upstream Ag Credit Supply (lbs/season)	Total Upstream Ag Credit Supply Minus Total Upstream Demand (lbs/season)	Credit Supply Meets Demand? (Y/N)	Total Upstream Ag Credit Supply (lbs/season)	Total Upstream Forestry Credit Supply (lbs/season)	Total Upstream Ag and Forestry Credits minus Total Upstream Demand (lbs/season)	Credit Supply Meets Demand? (Y/N)	Credit Supply Meets Demand? (Y/N)
Yellowstone River																					
MT0026808	Stillwater Mining Company - East Boulder	788	2/1/2030	1	5	N	12	N	40	52	N	1	5	5	N	12	40	52	N	N
MT0021750	Absarokee	204	2/1/2035	8	100	N	251	Y												Y
MT0020478	Red Lodge	658	7/2/2035	5	12	N	30	N	41	71	N	5	12	12	N	203	41	244	N	N
MT0020311	Laurel	1,647	8/1/2030	204	2,904	Y														Y
MT0000281	Western Sugar Cooperative	0	1/1/2030	11	192	Y														Y
MT0022586	Billings	2,406	11/1/2034	2	23	N	57	N	2	59	N	226	3,224	-73	N	8,061	1,101	5,865	Y	Y
MT0030180	Yellowstone Energy Limited Partnership Facility	593	5/1/2034	1	18	N	45	N	3	48	N	227	3,242	-2,461	N	8,106	1,104	3,507	Y	Y
MT0020001	Miles City	1,980	4/1/2031	465	7,849	Y														Y
Missouri River																					
MT0021458	Dillon	1,179	3/1/2030	102	1,533	Y														Y
MT0022608	Bozeman	3,534	6/1/2032	8	138	N	345	N	121	465	N	8	138	138	N	345	121	465	N	N
MT0021857	Manhattan	32	9/1/2030	43	784	Y														Y
MT0023566	Elkhorn Health Care WWTP	6	2/1/2030	4	14	Y														Y
MT0022560	East Helena	501	3/1/2030	5	37	N	92	N	79	171	N	9	51	45	N	127	130	251	N	N
MT0022641	Helena	5,119	10/1/2032	1	2	N	5	N	10	15	N	10	53	-454	N	132	140	-235	N	N
MT0021920	Great Falls	15,931	12/1/2030	508	8,287	N	20,718	Y												Y
Clark Fork																					
MT0027430	Rocker	175	6/1/2033	4	39	N	98	N	40	138	N	4	39	39	N	98	40	138	N	N
MT0022012	Butte	0	4/1/2032	4	39	Y														Y
MT0021431	MT Behavioral Health Inc WWTP	16	8/1/2032	19	204	Y														Y
MT0022616	Deer Lodge	708	3/1/2033	9	205	N	513	N	116	628	N	32	448	257	N	1,120	365	1,294	Y	Y
MT0022594	Missoula	956	3/1/2030	189	1,093	Y						221	1,541							Y
River																					
MT0020028	Hamilton	1,943	9/1/2031	52	275	N	687	N	669	1,356	N	52	275	275	N	687	669	1,356	N	N
MT0020168	Lolo	611	9/1/2034	32	305	N	763	Y				84	580	-1,363	N					Y
Milk River																					
MT0022535	Havre	1,975	5/1/2031	80	2,883	Y														Y
Creek																					
MT0020044	Lewiston	300	9/1/2032	5	114	N	285	N	46	330	Y									Y
Marias River																					
MT0020079	Conrad	436	2/1/2032	10	299	N	747	Y	1	748	Y									Y
Flathead Lake																					
MT0020397	Bigfork	0	8/1/2030	23	112	Y														Y
Ashley Creek																					
MT0021938	Kalispell	0	6/1/2030	7	42	Y														Y

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Recognizing this areal distribution for upstream credit supply, NPS credit generating scenarios in Tables 5-1 and 5-2 include a sequence of five crediting options to compare available credits to satisfy potential demand as follows:

1. Exclusive upstream Ag credit supply assuming that 10% of farmers in these select HUCs would participate in trading
2. Exclusive upstream Ag credit supply assuming that 25% of farmers might participate in trading
3. Exclusive upstream Ag supply at 25% participation plus credits from forestry conservation practices that would collectively produce an overall 10% load reduction from upstream forested areas (excluding wilderness areas)
4. Total upstream Ag credit supply with 10% Ag participation
5. Total Upstream Ag supply at 25% participation plus forestry credit supply

As noted in the previous Section 4, Ag and forestry NPS credits may in some cases be in relatively short supply due to very limited rainfall in the critical trading months of July – September. As such, a greater number of landowners participating in trades will be necessary for NPS runoff generated credit supply. Ag participation rates of 10% and 25% may be quite high for typical PS/NPS programs where there are much larger reductions per acre expected given more temperate conditions in other trading settings compared to Montana's largely arid conditions. Thus, each successive scenario, starting with 10% Ag participation in exclusive upstream HUC-12s, generally offers more credits than the previous. For each scenario, a column identifies whether there are sufficient credits to meet demand with a "yes" (Y) or not, signified by a "no" (N). If demand is met for a PS, no further crediting scenarios are offered. Successive scenarios are applied until demand is met. If after the application of all five potential crediting scenarios, PS demand cannot be met by proposed NPSs, an "N" in the final column means that the PS may not be a likely candidate for trading with agriculture and/or forestry.

Towards these ends, the following observations are made from demand/supply comparisons in Tables 5-1 and 5-2 for TN and TP, respectively.

Overall Observations

- Of the 27 PSs identified with potential trading demand, only 19 realize ample credit supply considering both TN and TP. (Red Lodge falls short for both TN and TP supply; Stillwater Mining, Bozeman, East Helena, Helena, Rocker, Hamilton and Kalispell have one or the other nutrient credits with insufficient supply)
- Considering just TN (Table 5-1), all but 2 (Red Lodge and Kalispell) have sufficient credit supply. TN supply for Helena is only satisfied with the final and most generous credit scenario #5. Sixteen of the facilities will find sufficient TN supply in their exclusive upstream HUC-12 watersheds (scenario #1).
- The TP supply (Table 5-2) is a substantially different picture than TN. Even with the most generous crediting scenario #5, 7 facilities are unable to meet TP supply needs to fully offset demand (Stillwater mining, Red Lodge, Bozeman, East Helena, Helena, Rocker and Hamilton). Three other facilities meet TP supply needs with scenario #5 (Billings, Yellowstone Energy and Deer Lodge).

Yellowstone River

- Insufficient TN and TP supply for Red Lodge is most likely a function of only 5 upstream HUC-12s that could potentially deliver NPS credits. The same is true for TP supply shortage for Stillwater Mining with only 1 upstream HUC-12; a function of its location in a headwater stream.
- As noted above, Billings and Yellowstone Energy are short TP supply but not TN. The former has 226 upstream HUC-12s from which to potentially draw TP credits, though their demand (the largest of any of the 8 potentially trading discharges in the Yellowstone) still falls short under all proposed NPS crediting scenarios. Stillwater Mining's location in a headwater leaves it at a distinct disadvantage with only the HUC-12 in which it is located to generate credits.

Missouri River

- In the Missouri Basin, all 7 potentially trading PSs have ample TN supply from NPSs, though Helena requires scenario #5 to meet TN demand.
- Three point sources (Bozeman, Helena and East Helena) have insufficient TP credits in this basin. All have a relatively small number ($\leq$10) available upstream HUC-12s from which to draw credits.

Clark Fork

- Of the 5 potentially trading PSs in the Clark Fork, only Missoula shows some additional Ag credit need (scenario #2) to achieve TN supply beyond scenario #1.
- Rocker, with only 4 upstream HUC-12s to supply credits, has insufficient TP credit supply under all crediting scenarios. Deer lodge will need scenario #5 to meet TP demand.

All Other River Basins

- Kalispell, with only 7 upstream HUC-12s for credit supply has insufficient TN credits for trading under the 5 NPS supply scenarios. This is also a function of the large expected TN demand. Kalispell'sTP demand is zero, so TP credit supply is unnecessary for this plant.
- Hamilton TN supply is more than ample to meet demand, however, their substantial TP demand cannot be satisfied even with 52 upstream HUC-12s.

This comparative analysis of demand and supply represents a reasonable but conservative assessment of potential opportunities for trading amongst these 27 identified PSs. The next portion of this section uses these data and applies costs for WWTP upgrades versus cost for NPSs. Such an analysis will provide a more definitive picture for the economic case for trading.

What we address here, before moving to a specific demand/supply comparison for Miles City and then cost comparisons, is the recognition that this supply analysis makes no consideration for site-specific credit availability. Trading certainly cannot be explicitly ruled out for these particular PSs given localized upstream opportunities that simply cannot be known or discovered in the course of this rudimentary analysis. It is thus fully acknowledged in this report that other upstream crediting alternatives are possible (e.g., streambank restoration, cattle removal from streams, irrigation management, septic system disconnection, as well as other discharge alternatives including effluent reuse and to a very likely limited extent, PS/PS trading). Section 6 identifies approaches whereby PSs in limited credit situations can look to other support options to find credits. As with any future trading scenario, both PS and NPS conditions are site-specific and as such, every entity will need to specifically evaluate their particular conditions at a much greater level of detail to determine their benefits with trading. Here again, the proposed trading framework will outline solutions for how such conditions can best be evaluated. The following Miles City example will illustrate the considerations of seeking local credit supplies.

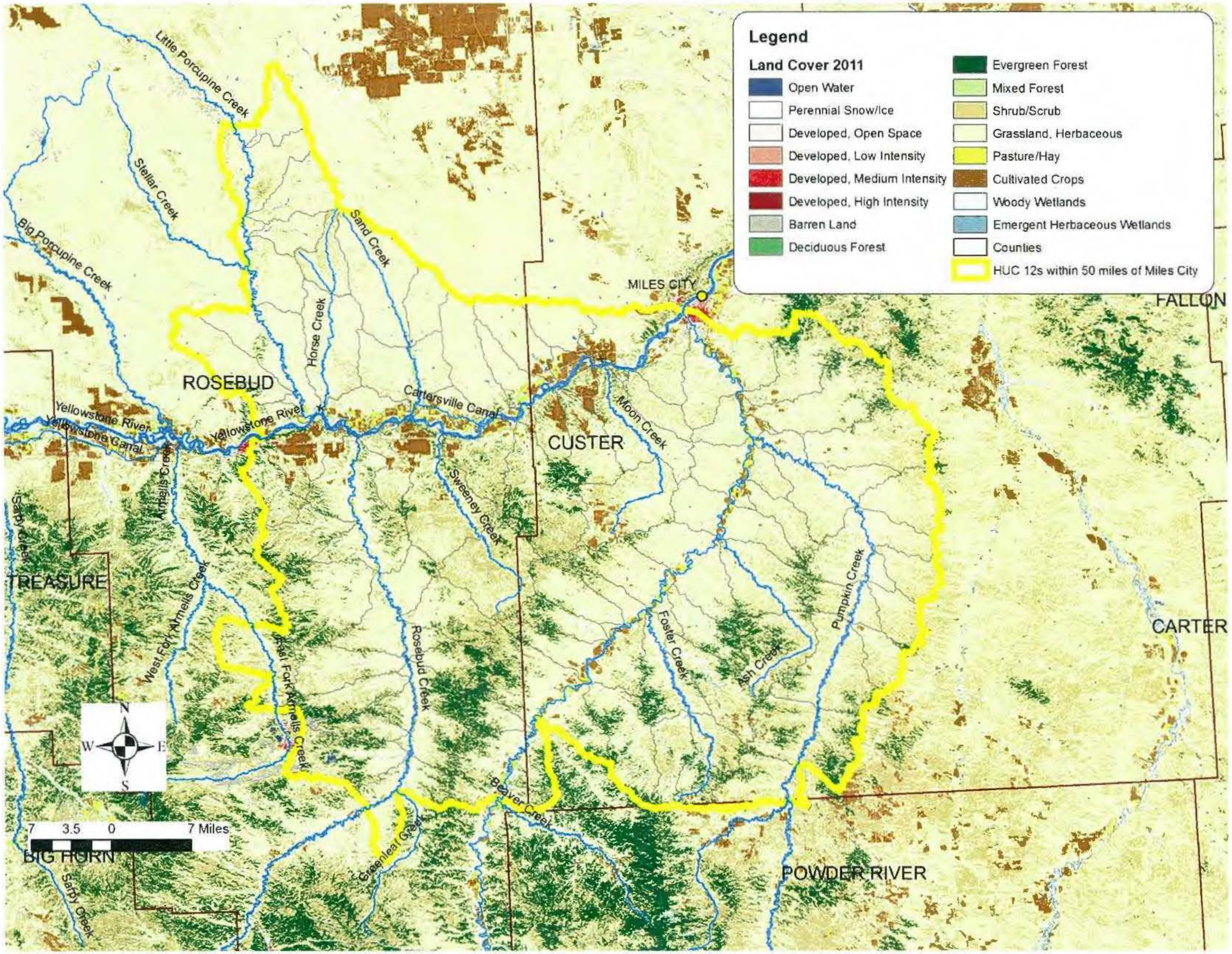
5.3 Miles City Demand/Supply Example Trading Analysis

A more detailed analysis of credit availability for the Miles City WWTP is presented here to illustrate an example trading scenario using the Project Team's assumptions for demand and supply reported herein. In general, a PS buyer will likely prefer engaging local landowners and/or conservation district staff in exploring credit opportunities. Even in situations where a point source is located at the downstream end of a large watershed and hence has ample upstream areas to purchase credits from, working with nearby landowners would provide a level of comfort and certainty for the buyer in a non-traditional permit compliance setting using WQT. Moreover, with increased distances between buyer and seller, greater is the potential for having to increase a trade ratio to account for fate and transport losses.

Miles City is located on the Yellowstone River in Custer County in the southeast part of the state (refer to Figure 5-1). The Yellowstone River at Miles City WWTP's discharge point has 692 upstream HUC-12s, excluding the Abasatoka-Beartooth Wilderness area. Among these HUC-12s, load reductions from 465 are exclusively available for Miles City as these are upstream only to this city. This analysis therefore focuses on the question that, without using the assumed 10% or 25% landowner participation rate, how likely it would be that Miles City WWTP would be able to find enough credits (and from how many landowners) in upstream HUC-12s to meet its increasingly stringent nutrient discharge limit.

The analysis therefore examined:

- Potential nutrient load reductions from agricultural sources (rangeland, pasture, and cropland) in the 75 HUC-12 watersheds within 50 miles upstream of the Miles City WWTP and within the area of the two counties of Custer and Rosebud (Figure 5-2)
- Available nutrient load reduction credits to Miles City WWTP from each of the 75 HUC-12 watersheds after an assumed trading ratio of 2:1 is applied but without an assumed participation (see Figure 5-3 for TN supply and Figure 5-4 for TP supply)
- The credit generation capability of each of the agricultural land uses in the 75 HUC-12s on a per acre basis
- The estimated number of farms in each of the three agricultural land uses based on the farm size obtained or derived from the 2012 Census of Agriculture by USDA and the total area of the land use from the 2011 USGS land cover dataset
- The potential credit demand of Miles City WWTP for each of its next four permit cycle and the corresponding area of each of the agricultural land uses required to meet this demand based on its per acre credit generation capability



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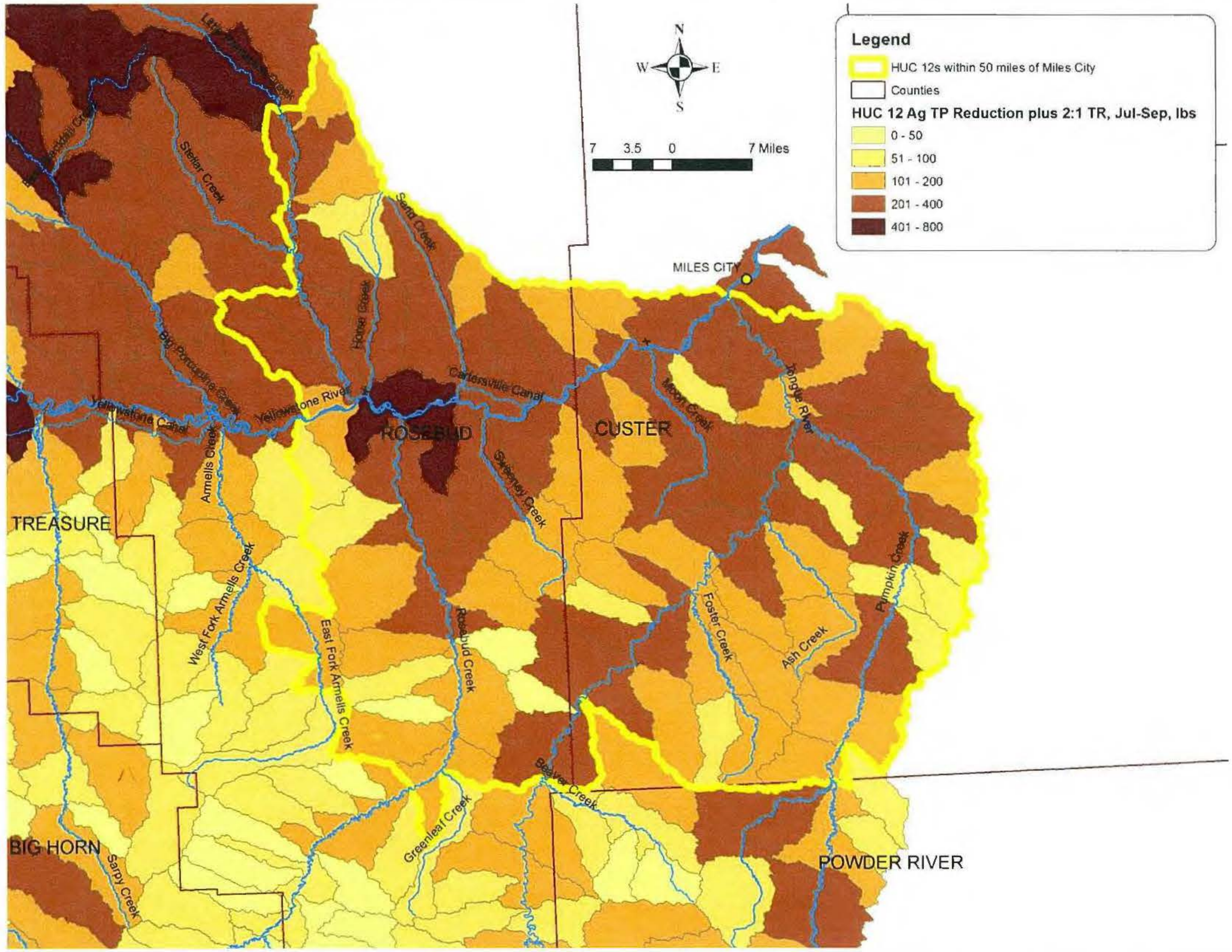
Land Cover in HUC-12s within 50 Miles Upstream of Miles City	PROJECT NO. 4842.006
0010891	FIGURE NUMBER 5-2



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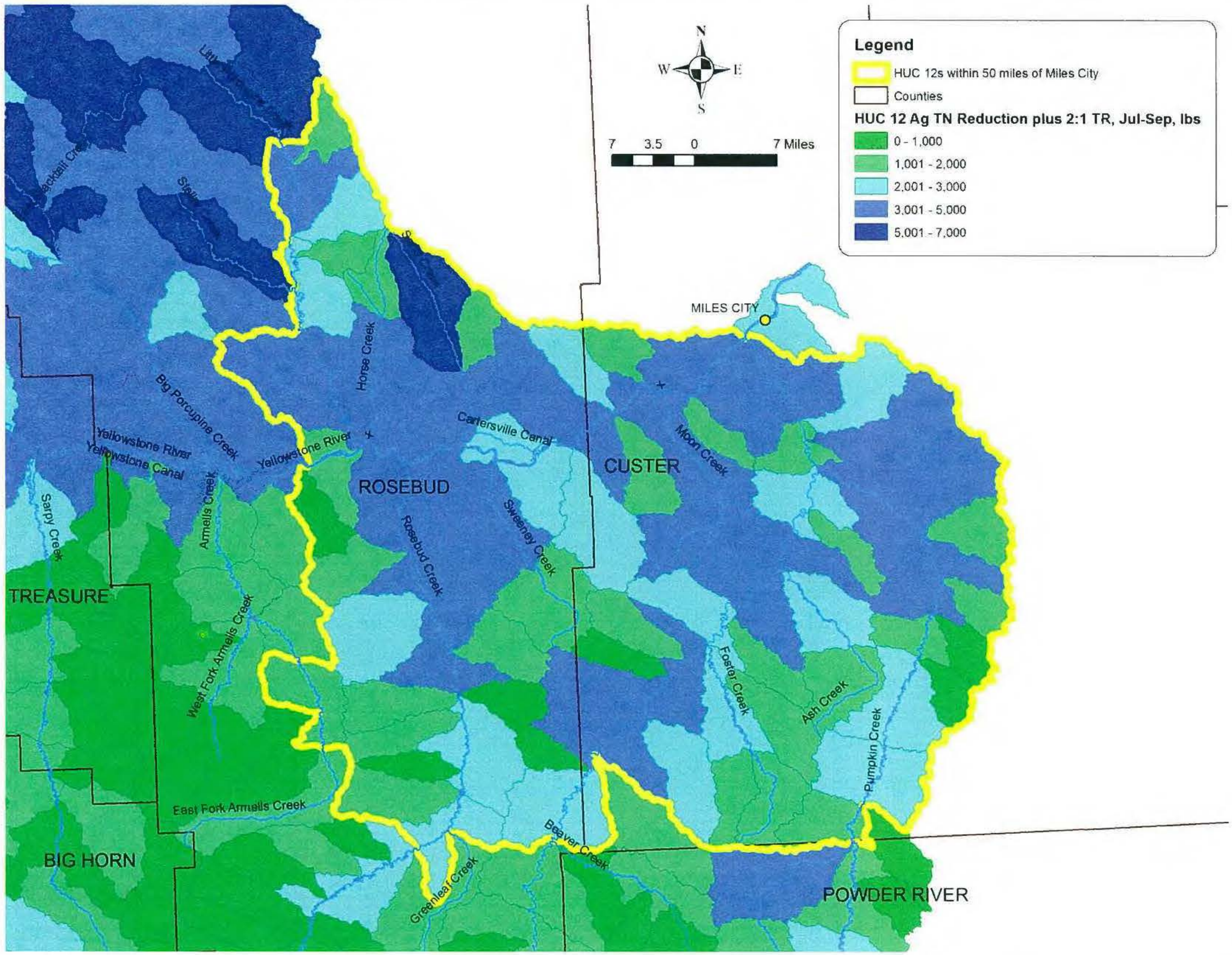
TP Credits by HUC-12s within 50 Miles Upstream of Miles City

PROJECT NO. 4842.006

FIGURE NUMBER 5-3

0010892



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TN Credits by HUC-12s within 50 Miles Upstream of Miles City

PROJECT NO. 4842.006

FIGURE NUMBER 5-4

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The Miles City supply analysis then compared the required land use area for credits that would be available in the 75 upstream HUC-12s to determine if sufficient supply existed. It further estimated the number of farms (hence number of landowners, assuming one landowner per farm) based on the required area and farm size. Comparing that number of landowners to the total number of landowners in the HUC-12s suggests an actual participation rate potentially necessary to generate sufficient credits to meet demand.

Tables 5-3 to 5-5 present the results of this analysis for rangeland, pastures and croplands, respectfully in these regards. It can be seen that due to their predominant presence in the nearby upstream HUC-12s, rangeland (ranches) alone would be able to generate sufficient credits to meet demands for both nutrients (Table 5-3). This is true in spite of the fact that rangeland has the lowest potential nutrient credits per acre (0.012 TP lbs/ac and 0.218 lbs TN/ac) among the three agricultural land uses. The participation rate required for ranches ranges from 10.6% for the most immediate permit cycle to 16.5% for the most remote. These values are well within the 10% and 25% participation rates assumed for the state-wide analysis.

Neither pastures (Table 5-4) nor croplands (Table 5-5) alone could generate sufficient credits to meet the demand from Miles City WWTP using the BMP application efficiencies assumed in this study. The arid conditions in this part of the state likely confine pastures and crop farms to river corridors where irrigation water is available (e.g., see Figure 5-5). This makes these two land uses far less common in the area than ranches. Thus, it is not surprising that available credits from pastures and croplands are limited in this particular setting. Nevertheless, croplands and/or pasture would still be able to generate a portion of the required credits. Therefore, these areas would remain as viable options for potential credits. And as noted above, site-specific opportunities will no doubt become a target for future buyers as opposed to an assumption that such substantial numbers of landowners would participate. Overall, this Miles City example helps illustrate the rationale for targeting "exclusive" upstream HUC-12s in the broader analysis for PSs.

TABLE 5-3
MILES CITY CASE ANALYSIS
RANCHES

Permit Cycle	Permit Date	TP Seasonal Demand (lbs)	TN Seasonal Demand (lbs)	TP based Acres Needed	TN based Acres Needed	Total Ranch Acres in the HUC-12s	Sufficient Ranch Acreage?	Estimated Total Number of Ranches in the HUC-12s	# of Ranches Required	Ranch Particip. Rate Required	Portion of Demand Met by Ranches
1	4/1/2016	1,272	11,620	109,727	72,943	1,037,250	Yes	134	15	10.6%	100%
2	4/1/2021	1,471	13,583	126,844	85,265		Yes		17	12.2%	100%
3	4/1/2026	1,765	13,854	152,213	86,966		Yes		20	14.7%	100%
4	4/1/2031	1,980	15,932	170,783	100,011		Yes		23	16.5%	100%

TABLE 5-4
MILES CITY CASE ANALYSIS
PASTURES

Permit Cycle	Permit Date	TP Seasonal Demand (lbs)	TN Seasonal Demand (lbs)	TP based Acres Needed	TN based Acres Needed	Total Pasture Acres in the HUC-12s	Sufficient Pasture Acreage?	Total Number of Pastures in HUC-12s	# of Pasture Farms Required	Pasture Particip. Rate Required	Portion of Demand Met by Pastures
1	4/1/2016	1,272	11,620	25,688	53,201	12,467	No	52	222	--	23.4%
2	4/1/2021	1,471	13,583	29,695	62,189		No		260	--	20.0%
3	4/1/2026	1,765	13,854	35,635	63,429		No		265	--	19.7%
4	4/1/2031	1,980	15,932	39,982	72,943		No		305	--	17.1%

TABLE 5-5
MILES CITY CASE ANALYSIS
CROP FARMS

Permit Cycle	Permit Date	TP Seasonal Demand (lbs)	TN Seasonal Demand (lbs)	TP based Acres Needed	TN based Acres Needed	Total Cropland Acres in HUC-12s	Sufficient Cropland Acreage?	Total Number of Cropland in HUC-12s	# of Crop Farms Required	Cropland Particip. Rate Required	Portion of Demand Met by Cropland
1	4/1/2016	1,272	11,620	70,826	65,231	51,334	No	120	166	--	72.5%
2	4/1/2021	1,471	13,583	81,875	76,251		No		192	--	62.7%
3	4/1/2026	1,765	13,854	98,250	77,772		No		230	--	52.2%
4	4/1/2031	1,980	15,932	110,237	89,438		No		258	--	46.6%

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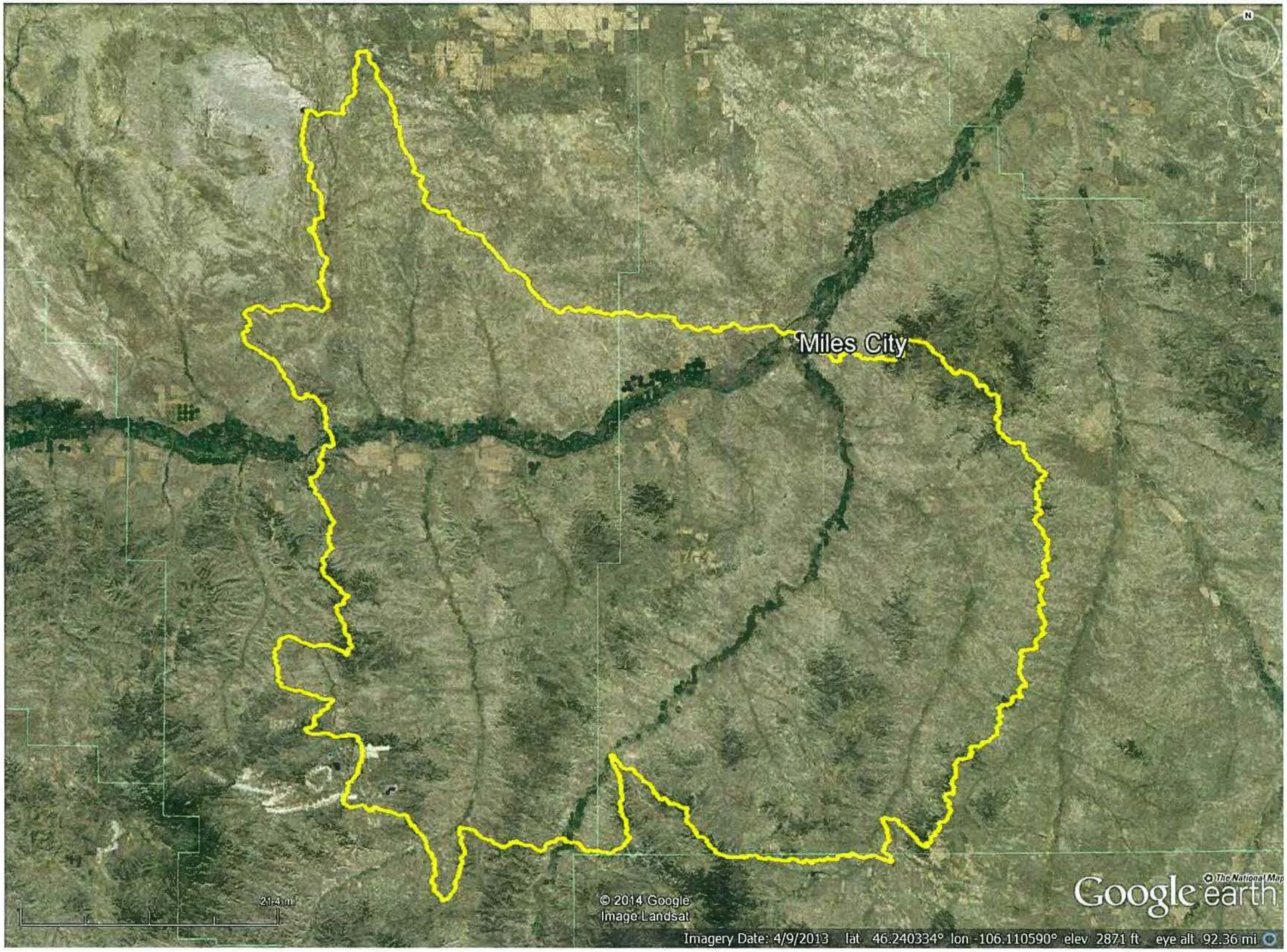

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Aerial Photo Illustrating Arid Conditions Upstream of Miles City

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0010897

FIGURE NUMBER 5-5

5.4 Cost Comparisons

Comparison of credit volume demand and supply presented in Tables 5-1 and 5-2 is used here to compare costs for WWTP upgrades versus Ag and/or forestry credits to determine whether there are economic benefits for trading in the various Montana settings. WWTP upgrade cost assumptions for this analysis are presented first followed by the approach used to estimate credit scenario costs. This section is concluded with a comparison of costs of upgrades versus use of nutrient credits to meet compliance needs.

For both sets of supply and demand costs, Net Present Values are used. This provides the most reasonable 20-year equivalent comparison of costs; the 20 years also just happening to correspond with the four permit cycles examined herein. NPV is the sum of the present values of the capitalization, operation and maintenance, replacement costs and transaction fees. The method adjusts future values based on an interest rate of 3.3% compounded annually. All current day values are left as is. The method allows you to compare different cost options in today's dollar.

WWTP Cost Assumptions

Point source unit values from Table 3-2 were calculated based on an NPV approach by assuming:

- Net Present Value allows different treatment options to be compared in current dollar estimates
- Future costs are all adjusted for inflation at a rate of 3.3 percent
- WWTP upgrade costs are evaluated based on a 20-year project life.
- Cost estimates for upgrades consider both the capitalization and operation and maintenance

Credit Cost Assumptions

For Ag credits, unit values were calculated on an NPV approach by assuming the following:

- A 50% TN and TP reduction
- Cost estimates for Ag settings based on doubling the implementation price for a Riparian Herbaceous Cover of grasses and forbs, NRCS practice standard 390 payment schedule[8] of $716.62/acre (assuming the full cost of the practice implementation was twice the payment schedule allowed under the Environmental Quality Incentive Program as NRCS support is typically 50% of the project costs; for trading applications, 100% of the costs are assumed here for credit pricing)
- A project life of practice standard 390 of 5 years
- The practice implemented four times to generate a 20-year project life in order to be compared against the point source NPV values
- In order to minimize channelized flow breaching the buffer, one acre of riparian herbaceous cover is assumed to effectively treat runoff from:
    - 500 acres of rangeland
    - 100 acres of pasture
    - 100 acres of cropland

[8] USDA-NRCS, Montana Practice Payment Schedule, Fiscal Year 2014, EQIP, Effective Date: January 31, 2014

- Per acre treated field reductions are derived as:
  - Rangeland: TN = 0.658 lbs/acre; TP = 0.029 lbs/acre
  - Pasture: TN = 2.507 lbs/acre; TP = 0.124 lbs/acre
  - Cropland: TN = 0.961 lbs/acre; TP = 0.045 lbs/acre
- Unit costs are based on credit values which require:
  - Implementing a 2:1 trade ratio to the reduction estimate
  - Adding an assumed 20% transaction cost

For forestry credits, unit values were calculated on a NPV approach by assuming:

- A 70% TN and an 85% TP reduction
- Cost estimates for forestry settings are based on doubling the implementation cost of the non-regulated per acre estimates for $403.34 per acre treated
- Forestry roads are assumed to be treated based on a list of general practices
- Project life of practices are 1 year
- Practices are implemented 20 times to generate a 20-year project life in order to be compared against the point source NPV values
- One acre of forestry road protection is assumed to serve 220 acres of forested land
- Per acre treated field reductions were derived as:
  - TN = 0.302 lbs/acre; TP = 0.023
- Unit costs are based on credit values which require:
  - Implementing a 2:1 trade ratio to the reduction estimate
  - Adding an assumed 20% transaction cost

These NPV assumptions and related calculations yielded unit costs for TN and TP credits as presented Table 5-6. The unit cost of a credit reflects how many conservation practice units (acres) have to be implemented to yield a credit that is appropriate for offsetting a pound of nutrient discharged. Therefore, for some practices, over two pounds of reduction per acre will take place with implementation. For this setting, a fraction of the acre unit cost is applied. When the practice generates less than two pounds of reduction, then multiple acres of implementation are required to generate a credit and the unit cost of a credit escalates accordingly.

TABLE 5-6
TN AND TP CREDIT COSTS
FOR VARIOUS BMP APPLICATIONS BY LAND COVER

BMP application	Cost ($/credit)	
	TN	TP
Rangeland	2.18	50.34
Pasture	2.87	57.95
Crop	7.48	160.93
Forestry	10.09	131.33

These estimated unit costs for credits appear much more effective for TN than for TP. This observation is born out with comparison of these with unit costs of upgrading WWTPs as presented in Table 5-7 (all as NPV).

TABLE 5-7
COMPARISON OF WWTP COSTS
WITH TN AND TP CREDIT COSTS

	Projected July-Sept Demand		Total Nitrogen Comparison							Total Phosphorus Comparison					Liklihood to Trade	
Description	TN Demand (lbs/ season)	TP Demand (lbs/ season)	TN Upgrade Cost (NPV)*	TN Upgrade Cost (Max Permit Cost Seasonal $/lb)**	Max Unit Cost Permit Cycle	TN Upgrade Cost (Full Build Out Permit Seasonal $/lb)**	TN Trading Cost (NPV)	TN Credit Cost (Seasonal $/lb)	TN WQT Cost-effective-ness (<75%)	Maximum TP Upgrade Cost (NPV)	Maximum TP Upgrade Unit Cost (Seasonal $/lb)	TP Trading Cost (NPV)	TP Credit Cost (Seasonal $/lb)	TP WQT Cost-effective-ness (<75%)	Likely to Trade TN	Likely to Trade TP
Western Sugar	3,140	0	$ 1,473,484	$ 23.46	4	$ 23.46	$ 180,236	$ 2.87	12%	$ -	$ -	$ -	$ -		Y	N
Elkhorn Health	43	6	$ 207,066	$ 244.32	4	$ 244.32	$ 2,411	$ 2.87	1%	$ 2,562	$ 21.16	$ 6,954	$ 57.44	271%	Y	N
Missoula	18,558	956	$ 3,418,153	$ 9.21	4	$ 9.21	$ 1,065,229	$ 2.87	31%	$ 144,574	$ 7.56	$ 2,859,749	$ 149.57	1978%	Y	N
East Helena	2,004	501	$ 1,276,862	$ 31.86	4	$ 31.86	$ 115,030	$ 2.87	9%	$ 212,073	$ 21.16	Credit<Demand	Credit<Demand	N/A	Y	N
Dillon	6,901	1,179	$ 4,445,948	$ 32.21	4	$ 32.21	$ 396,117	$ 2.87	9%	$ 499,029	$ 21.16	$ 1,366,461	$ 57.95	274%	Y	N
Laurel*	0	1,647	$ -	$ -			$ -	$ -		$ 697,245	$ 21.16	$ 6,123,279	$ 185.86	878%	N	N
Bigfork	981	0	$ 790,032	$ 40.25	4	$ 40.25	$ 56,329	$ 2.87	7%	$ -	$ -	$ -	$ -		Y	N
Manhattan	263	32	$ 70,468	$ 40.46	3	$ 13.41	$ 15,096	$ 2.87	21%	$ 2,432	$ 3.85	$ 37,088	$ 58.79	1525%	Y	N
Great Falls*	15,931	15,931	$ 815,896	$ 2.56	4	$ 2.56	$ 914,420	$ 2.87	112%	$ 7,924,084	$ 24.87	$ 18,464,029	$ 57.95	233%	N	N
Miles City	15,931	1,980	$ 6,141,728	$ 19.62	2	$ 19.28	$ 914,497	$ 2.87	15%	$ 838,177	$ 21.16	$ 2,294,820	$ 57.94	274%	Y	N
Havre*	2,469	1,975	$ 825,727	$ 16.72	4	$ 16.72	$ 141,721	$ 2.87	17%	$ 836,154	$ 21.16	$ 2,289,518	$ 57.95	274%	Y	N
Conrad	1,126	436	$ 892,031	$ 39.61	4	$ 39.61	$ 64,632	$ 2.87	7%	$ 184,493	$ 21.16	$ 505,171	$ 57.95	274%	Y	N
Bozeman	2,651	3,534	$ 176,989	$ 3.34	4	$ 3.34	$ 151,167	$ 2.87	85%	$ 534,449	$ 7.56	Credit<Demand	Credit<Demand	N/A	N	N
Mt Behavioral Health	67	16	$ 326,964	$ 244.32	4	$ 245.22	$ 3,846	$ 2.87	1%	$ 6,608	$ 21.16	$ 18,544	$ 59.39	281%	Y	N
Lewistown	0	300	$ -	$ -			$ -	$ -		$ 23,091	$ 3.85	$ 451,138	$ 75.19	1954%	N	N
Helena	1,219	5,119	$ 106,346	$ 4.36	4	$ 4.36	$ 182,362	$ 2.87	171%	$ 2,546,008	$ 24.87	Credit<Demand	Credit<Demand	N/A	N	N
Deer Lodge*	0	708	$ -	$ -			$ -	$ -		$ 54,596	$ 3.85	$ 820,572	$ 57.95	1503%	N	N
Rocker	177	175	$ 401,586	$ 113.45	4	$ 113.45	$ 10,166	$ 2.87	3%	$ 74,175	$ 21.16	$ 10,141	$ 57.95	274%	Y	N
Yellowstone Energy	0	593	$ -	$ -			$ -	$ -		$ 250,846	$ 21.16	$ 1,908,630	$ 160.93	761%	N	N
Lolo	2,884	611	$ 2,356,036	$ 40.85	4	$ 40.85	$ 165,578	$ 2.87	7%	$ 258,533	$ 21.16	$ 707,904	$ 57.93	274%	Y	N
Billings*	24,055	2,406	$ 1,023,464	$ 2.13	4	$ 2.13	$ 1,380,814	$ 2.87	135%	$ 363,784	$ 7.56	$ 4,404,382	$ 91.53	1211%	N	N
Absarokee	1,387	204	$ 1,042,714	$ 37.60	4	$ 37.60	$ 79,614	$ 2.87	8%	$ 86,313	$ 21.16	$ 656,594	$ 160.93	761%	Y	N

*Currently upgrading facility (either in design or construction). TN and TP adjusted to expected performance after upgrade.

**The difference between TN Upgrade Cost (“Max Permit Cost Seasonal $/lb”) and TN Upgrade Cost (“Full Build-Out Permit”) reflects whether the entity upgrades early (i.e., before growth and corresponding increased influent flows) or for upgrade costs of the full build-out divided by the existing reduced pounds of TN. See text for additional narrative.

No associated demand need

Insuffient Credits

N/A = Not Applicable due to supply limitation

WWTP exclusion from the Table 5-7 comparative cost analysis was based on the following rationale as to why five facilities of the originally identified 27 would not likely engage in trading:

- Red Lodge and Kalispell did not have sufficient upstream TN credit supply
- Stillwater Mining and Hamilton had no TN demand but for their TP demand, supply was insufficient
- Butte is expected to have no future demand for either TN or TP credits based on their ability to otherwise meet variance limits with anticipated upgrades

The final two columns in Table 5-7 reveal that there may only be 14 PSs that would find trading (and then only for TN), cost-effective using Project Team assumptions for Ag and forestry NPS credits. These are based on the comparison of unit costs of WWTP upgrades for both TN and TP versus costs of credits. Four facilities in this comparison (Great Falls, Bozeman, Helena and Billings), though having ample TN credit supply, still appear to have greater efficiencies to meet TN limits with plant upgrades despite relatively low TN credit costs. This is denoted by WQT percent effectiveness exceeding a 75% threshold expressed as a function of credit costs divided by upgrade costs. In all cases for TP, trading is quite ineffective.

Worth noting in this table is the difference between TN Upgrade Cost ("Max Permit Cost Seasonal $/lb") and TN Upgrade Cost ("Full Build-Out Permit"). If the entity upgrades early (i.e., before the influent flow is there) then the upgrade cost are for full build-out divided by the existing reduced pounds of TN. Therefore, trading can be used to delay the upgrade for a permit cycle which will make the unit cost of the upgrade lower. The full build-out costs reflect the maximum NPV divided by the maximum reduction. The maximum is used for TN because it is a biologically-treated parameter, and it needs to have the treatment units reflect modifications. TP is a chemically treated parameter, and can be added to existing units using an outside tank and pump as a source, and then modifying the plumbing. Extra biosolids from the addition of precipitant for TP is not assumed here to exceed the existing clarifier capacity. Thus, increases in TP most often reflect minor upgrades for equipment and then addition of more chemicals. This is why the TN columns compare maximum cost versus full build-out where TP does not.

Most notably, those facilities that decide to use trading to fully offset TN demand will also get some TP credits produced from Ag and/or forestry practices. The TP unit prices in this example are not cost-effective by themselves, but are essentially "free" if the PSs have already purchased TN credits (i.e., paid for practices to produce TN credits). This would reduce the TP chemical costs in an almost linear fashion, but not necessarily achieve TP compliance in and of themselves absent some chemical treatment at the plant.

Because of various assumptions used in the NPS credit calculations, and especially with no readily available runoff data for corroborating EMCs, the Project Team believes that the first and most appropriate indicator of trading potential in Montana should focus on the demand analysis. This is the identified potential trading need for 27 PSs that likely cannot meet variance limits with current treatment technology. Next in the sequence for assessing trading potential are unit upgrade costs for these WWTPs. Lastly in the consideration are credit costs used for comparison to unit upgrade costs. NPS credit costs, as extrapolated in this comparative analysis, suggest that other conservation practices should be considered. The current, broadly applied landscape practices yield cost-effective TN credits, but not so for TP credits. Most importantly, upstream site-specific condition assessments will most likely be needed to help buyers better determine local NPS options that may have high and much more consolidated crediting potential. Such is the case for actual PS/NPS trades in all WQT programs.

It is therefore important to recognize the limitations of relying upon NPS runoff-based credits used in this analysis to meet demand, particularly in the driest time of the year (July – September) and in an arid setting. This again points to the inherent need for local knowledge of other exacerbating conditions in upstream watershed settings for PSs considering trades. Tapping into locally knowledgeable staff of Conservation Districts (CDs) for example, will be an important consideration for buyers seeking higher more concentrated crediting opportunities. CDs have unique experience in these regards, knowing areas with water quality concerns, and knowing and often having the trust of landowners to be able to cost-effectively engage them in dialogue.

There will also be large (non-wadeable) river settings for a portion of the 27 identified PSs where dilution considerations and TMDLs will ultimately drive permit limits. As such, current extrapolations from wadeable streams may not apply in the manner in which these have been used in these non-wadeable settings. In either setting, however, trading to meet high credit needs potentially requiring tens to hundreds of landowners to participate may simply be unrealistic. Thus, consideration for upgrades to interim variance limit treatment capacities and then completion of compliance needs with trading should be independently considered by each discharger with substantial demand.

The WWTP and NPS credit cost projections in this section should be taken as indicative of general trading conditions, and not be considered definitive. Approaches used in these regards are potentially sensitive to key parameters such as practice costs for TN and TP reduction, and obviously subject to improvement given more site and practice-specific data. Thus, these results should not be construed as the last word, but rather combined with full analysis of each WWTP setting, upstream watershed conditions and permit schedule impact on costs to more clearly address specific trading opportunities.

All of these particular conditions set the backdrop for the Business Case discussion for trading presented in the next and final section of this report.

6.0 THE BUSINESS CASE FOR WQT IN MONTANA

6.1 Overview

The business case analysis for a WQT program in Montana is presented in this section. The focus of business case development was on the potential volume of trades and the economic viability of WQT under Montana's trading policy Circular DEQ-13. To best facilitate the potential level of nutrient trading that might occur in Montana, the business case was to recommend the development of a formal trading framework under the trading policy to be supported by a one-time MDEQ investment. The business case analysis therefore explicitly focuses on findings of Sections 3 to 5 of this report. These analyses revealed a limited number of potentially viable PS/NPS trades in Montana. As such, the Project Team is recommending that MDEQ not invest in the development of a formal trading framework. Alternatively, we identify potential MDEQ investment opportunities that could better facilitate the limited expected trading as well as simplify associated MPDES permitting needs under the existing policy. Products of such investments could be addressed via appendices to the trading policy. These could also include simple tracking tools used by permit writers and PSs, and stakeholder outreach. We elaborate on these findings and recommendations in the remainder of this section.

6.2 WQT Potential in Montana

More than 200 WWTPs in the state were initially considered for trading potential as buyers of NPS credits from agriculture and forestry conservation practices. Only larger PSs and others with mechanical treatment capabilities were ultimately considered relevant for trading based on applicability under Circular DEQ-12B (Nutrient Standards Variances) and/or TDMLs. This resulted in 27 PSs subsequently identified with potential treatment upgrade needs to meet projected effluent limits (refer to Table 3-1). All treatment upgrade needs considered effluent limits projected by MDEQ in response to instream nutrient standards Circular DEQ-12A concentration limits and their period of application.

Of the 27 PS candidates for trading, only two facilities (Red Lodge and Kalispell) would not likely find sufficient Ag and/or forestry NPS credits to meet their TN demand as a function of geographically-limited upstream areas (refer to Table 5-1). Six facilities did not have sufficient NPS credits for TP to meet demand also largely as a function of limited upstream areas (i.e., $\leq$10 upstream HUC-12s for credit generation per PS). These PSs included Stillwater Mining, Red Lodge, Bozeman, Helena, East Helena, and Rocker (Table 5-2). TP demand for one facility (Hamilton) exceeded supply even with 52 upstream HUC-12s. TP supply limitations in all seven cases occurred even with a scenario of higher levels of Ag participation (at 25% of all upstream areas) and forestry (with 10% of upstream areas implementing forestry conservation practices). In total, NPS credit supply for TN and TP was only sufficient for 19 of the 27 PSs.

When ultimately comparing unit costs of NPS credits ($/credit) with equivalent unit costs for TN and TP facility upgrades ($/pound), even fewer trades appeared likely. In this analysis, only 14 WWTPs appear to have demand, supply and economic conditions that may lead them to consider trading, and then only for TN (refer to Table 5-7). These facilities (and their discharge classification) include:

- Western Sugar Cooperative (major)
- Missoula (major)
- Dillon (major)
- Bigfork (major)
- Miles City (major)
- Havre (major)

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- Elkhorn Health Care (minor)
- East Helena (minor)
- Manhattan (minor)
- Conrad (minor)
- Montana Behavioral Health (minor)
- Rocker (minor)
- Lolo (minor)
- Absarokee (minor)

Of the six major dischargers, Missoula is the largest that might benefit from TN trades where credit costs are 31% of upgrade costs. Miles City would stand to save nearly 85% or $5M of projected upgrade costs with TN trading. Potential nitrogen treatment savings with NPS credits for all 14 potential buyers range from 1-31% of upgrade costs based on Table 5-7 cost assumptions. Of the more than $23M in projected upgrade costs for these 14 PSs to meet TN limits, equivalent TN trading costs are estimated at $3.2M, an approximate $20M savings over 20 years, at about an average of 14% of the cost of upgrades for all. From Table 3-2, these $23M upgrade costs represent over 85% of all projected upgrades for TN treatment at the 27 originally targeted facilities for trading.

Because NPS phosphorus credits considered herein ranged from an estimated $58-161/credit compared to equivalent unit upgrade costs of approximately $4-25/pound, trading for TP is not considered cost-effective for these facilities (nor any others).

Of particular note for any potential PS/NPS trading scenario in Montana is the limitation of NPS runoff-generated credits largely due to very low rainfall during the critical months of July to September (typically <2 inches) when instream nutrient standards must be met. In some cases as noted above, facilities are located in headwater areas where there is insufficient upstream land to generate such credits. For others, beneficial cost differentials between WWTP upgrades and NPS credits considered herein do not exist. Notably in some settings with larger facilities (see Section 4-6), the potential to obtain additional nitrogen offsets from septic system disconnects, though expensive, is possible and may be a feasible alternative where NPS TN credits are in short supply or too difficult to aggregate. Though not considered in this study because of a paucity in available research findings and/or site-specific details needed for credit calculations, nitrogen reductions from improved irrigation practice management are a possibility in select areas where upstream irrigation is present above a WWTP. Such options would need to be identified on a case-to-case basis.

There are perhaps, certain trading options that should be considered by any PS considering trading. For example, purchasing credits initially for TN could provide compliance for one or more permit cycles before plant upgrades necessary to meet future more stringent TN effluent limits would need to be implemented. Conversely, it might be advisable for certain facilities to upgrade in earlier permit cycles to meet second or third permit cycle nutrient targets, then use trading for a much smaller incremental level of required reductions with latter permit cycles. Such considerations revealed in the cost analysis for demand and supply (Table 5-7), reinforce a fundamental premise of trading; all potential buyers must each carefully examine their own particular needs and opportunities.

Based on these study findings, there appears to be a relatively limited number of potential PS/NPS trading opportunities in Montana. These are also likely to be spread out over four permit cycles. As such, we recommend that MDEQ:

- Not invest in formally developing any specific and/or prescriptive WQT program framework under CIRCULAR DEQ-13. Rather, MDEQ should simply allow PSs that might choose to trade, to best determine how they should each proceed under CIRCULARS DEQ-12A, 12B and 13 absent a formal WQT framework.
- Alternatively consider limited investments to write appendices to DEQ-13 that clarify and facilitate credit calculation methods, provide standardized forms for trading participants and lay out expectations for crediting project verification and aggregator participation.
- Consider limited investments in expenditures for public outreach and/or workshops related to DEQ-13 suggested appendices.

The remainder of this report discusses additional details of these recommendations.

6.3 Consideration of WQT Framework Elements

To facilitate potential PS/NPS trading in Montana, the Project Team originally proposed consideration of four WQT framework structures that could be developed with additional MDEQ investment to address the potential level of nutrient trading that might occur in Montana. Based on the limited number of potentially viable PS/NPS trades (and then just for TN), considerations for a WQT business case do not portend substantial benefits with formal framework development by MDEQ. In this light, it is still useful to elaborate on rationale for why frameworks would not apply, and alternatively, why various elements of select trading structures would still be useful for trading participant use and application. These framework element considerations are as follows:

- <u>Bilateral trading</u>: With a limited number of likely buyers in the Montana WQT market, building a prescriptive bilateral trading framework within the existing trading policy will not necessarily provide greater cost savings and/or facilitate more trades. Rather, the Project Team simply emphasizes here that bilateral trades will be the default approach for future credit exchanges under the current policy. This is appropriate and likely sufficient for the limited number of potentially participating PSs over the next four permit cycles (i.e., next 20 years). In this manner, buyers will negotiate directly with sellers. These trading conditions can best be stipulated in the MPDES permit with standard permit writing and specific regulatory review per the Montana trading policy. Thus, the basis for trading would still remain within individual MPDES permits with reporting requirements and other trading policy elements remaining as the responsibility of the point source.

- <u>Brokerage/aggregator models</u>: Where Montana PSs have significant credit demand (particularly for TN), there will be opportunities for brokers and aggregators to assist buyers to find credits. The Miles City example is illustrative of where a PS might find it difficult or undesirable to attempt to find and negotiate with several different individual landowners. They would potentially need to secure credits where there could likely be hundreds of potential credit generators depending on the types of practices or projects considered for generating credits. Third parties may therefore be sought out by buyers to find and/or sell aggregated credits. Local knowledge of farming operations and landowners would likely be a key element to the success of third party brokers and/or aggregators. The basis for trading contracts would remain as a bilateral negotiation between a buyer and third party with the permit still representing the trading instrument. With the limited number of potential buyers, and with the trading policy already recognizing intermediaries, creation of a new framework around aggregator/broker participation does not appear to be necessary.

- <u>Clearinghouse structure</u>: The geographically sparse demand for credits, and the variable timing of need, coupled with the challenge of securing sufficient credit seller interest in a limited demand market, does not justify MDEQ investment in a clearinghouse program structure. This is particularly true for a state-run clearinghouse that might be similar to PennVEST in Pennsylvania where there is one authorized public entity that holds and manages all credits for buyers and sellers in larger market settings for the entire state. This does not necessarily exclude the opportunity for private investment in such a functioning structure that would otherwise still operate under Montana trading policy. However, the substantial costs to MDEQ to create a separate entity, or to integrate this into a currently operating state governance structure, do not appear warranted at this time.

- Watershed-based program plans: It is possible that in a few instances in the upper Yellowstone and the central section of the Missouri River around Helena, that collaboration between point sources could facilitate trading. PS collaboration to jointly pursue and secure credits could provide buyer cost-savings through reduced transaction costs. (Analyses in this study assumed 20% transaction costs with credits.) This trading plan approach could be similar to Ohio's WQT Rules where one trading plan is established to address multiple potential buyers in a watershed where there is collective need for credits amongst multiple buyers, though principally driven by a TMDL. This would not, however, necessarily require a MDEQ investment or modification of the trading policy. The opportunity for point sources to collaborate to secure credits is not necessarily precluded by the policy now. Thus, a WQT plan that would involve multiple point sources in a specific basin could provide a means to pool resources and provide cost-savings through collaboration. This again is where a credit aggregator or other third-party entity could help manage such an effort. Regardless of pooled resources, the basis for trading would still remain within individual MPDES permits, and/or with these reflecting TMDL wasteload allocations. As there are numerous uncertainties as to what circumstances and where such pooled resources could be beneficial, PSs would need to specifically and jointly examine these opportunities. Thus, a one-time MDEQ investment in supporting such coalitions or advancing any particular framework structure in these regards is speculative at this time and is not recommended.

In summary, MDEQ recognition of bilateral exchanges as the default mechanisms for trades with the MPDES permit serving as the legal instrument, does not require MDEQ trading framework/program investment. Opportunities for broker or aggregator participation already exist under the trading policy. Thus, there are no obvious benefits for MDEQ investments to develop some prescriptive or enabling aggregator framework under the policy for supporting future trades in what evidence suggests will be a thin market.

That said the Project Team identifies here alternative options for MDEQ investments to support the trading policy that would encourage trading participation and ease administrative burdens and uncertainty for participants and MDEQ. In turn, these should reduce administrative costs of trading for participants and MDEQ. These are defined in the following section with estimated costs for development and institutionalization along with long-term sustainability considerations. These sustainability considerations for one-time MDEQ investments are based on the likely limited market size projected by this study. Costs are best professional estimates assuming MDEQ retention of outside experts to assist in development of recommended elements to support the trading policy.

6.4 Recommendations for Potential MDEQ Investments to Support Circular DEQ-13

Bilateral trades through MPDES permits should include the necessary checks and balances to ensure credibility of trade transactions. Assurances are necessary for regulators and regulated entities that compliance goals are being met through NPS trades, as well as public assurances that water quality is being protected. Methods for ensuring trading credibility include providing transparency through regular reporting and requiring third-party verification of credit-generating practices. We describe here the essential elements for these mechanisms to illustrate why the Project Team recommendations merit MDEQ consideration for one-time investments. Fundamentally, trading under Montana policy should be reflected in each MPDES permit with standardized approaches that would provide for consistent and repeatable applications. Investment recommendations therefore focus on:

- Standardized verification, tracking and reporting of trades
- Standardized credit estimation
- Clearly defined aggregator/broker roles
- Outreach workshops for potential market participants
- Outreach training for potential aggregators/brokers on relevant policy considerations.

We provide here, additional considerations for developing these recommended elements to support trading. Where appropriate, such information might best be developed as recognized appendices to CIRCULAR DEQ-13.

6.4.1 Verification, Tracking and Reporting

Bilateral trading under the WQT policy should provide the mechanisms and/or guidelines for credit verification, tracking of credit use, and reporting to ensure trading credibility and provide transparency.

Verification of credit generating practices is a crucial component which ensures credibility, transparency, and maintenance of best practices in water quality trading programs. Verifiers are typically accredited experts who act as third party reviewers or auditors. They work directly, in the field with credit generating project developers to ensure that practices are implemented and functioning as planned. While specific roles and responsibilities may vary in form between programs or even project sites, general verification processes typically follow the same patterns. Verification objectives under the Montana trading policy should define the roles, function, protocols and requirements for third-party verifiers. Roles should consider: 1) reviewing credit estimations; 2) verifying measurement accuracy; and 3) submitting a verification report. Throughout the verification process, verifiers will likely complete summary reports which may or may not be fully disclosed to the public, as well as field notes with opinions of credit estimates, activities, and any other relevant findings. Thorough recording of verification activities, again, supports trading transparency and the accurate application of crediting values.

For tracking water quality trades, the creation of a simple and consistent format for relevant information through the development of standardized tracking forms. Tracked activities of trades could be performed by the buyer and/or their aggregator representative to document, for example:

- Credit generation
    - o Practice type
    - o Types of implemented crediting practices
    - o Acres treated by each practice
    - o Nutrient reductions generated by each practice
    - o Cost of practice implementation
    - o Location of each practice

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  - Landowner contact information
  - Unit cost of reductions
- Trade transaction
  - Buyer contact information
  - Seller contact information
  - Credit sale price
  - Number of credits associated with trade agreement
- Practice verification information
  - Verifier's identification
  - Practice inspection dates
  - Status of implemented practices
  - Identification of practice deficiencies

For program reporting, it is necessary to maintain a balance between the need for public transparency and maintaining confidential, private information. Not all information that is tracked and managed by the buyers, sellers and/or aggregators will necessarily need to be made public. Reports on select trading activities provided to the public will, however, balance the need for transparency with the desire to maintain the privacy of participants. Many agricultural producers, for example, may be reluctant to participate in a program that will disclose information about the individual or farm operations. As such, care should be taken to respect the privacy of program participants. In some instances, private information (such as names and contact information) can be excluded from public documentation. In addition, certain information can be aggregated to address privacy concerns.

Public reporting of activities must be consistent with Montana trading policy while specific actions or activities can be more efficiently captured and reported in standardized forms which might include the following:

- Total BMPs implemented by practice type
- Total credits generated
- Number of credit transactions
- Total number of buyers
- Total number of sellers

Monthly trading credits used for compliance should be reported on monthly DMRs. MDEQ should produce an annual summary of trades conducted within each permit. This can be accomplished by tracking these in a spreadsheet based on DMR information. The MDEQ would maintain this simple "registry" of trade transactions to track and document credit exchanges.

Recommended elements for MDEQ investment under these topics therefore include development of:

1. Draft permit language for defining these trading expectations in permits
2. Recommended buyer tracking elements and forms
3. Third-party verification requirements, forms and protocols
4. Modifications for DMRs to include trading credit use
5. Simple MDEQ tracking format for MDEQ use and public disclosure

Given the general availability of these types of trading elements from other established programs, anticipated one-time MDEQ investment costs for these would likely range from $25,000-$50,000.

6.4.2 Credit Estimation Methods

Consistent and standardized methods for calculating nutrient reduction credits should be defined and adopted by MDEQ under CIRCULAR DEQ-13. In all trades, it is necessary to estimate/quantify the nutrient reductions generated from each implemented practice intended to produce TN and TP reductions. One set of tested and approved credit calculation methods will help streamline assessment of trading opportunities by buyers as well as permit reviews by MDEQ. Documentation and training on proper application of credit calculators are necessary for trading participants. In addition, a standardized method for calculating trade ratios to address buyer/seller location considerations as outlined in the trading policy, should be established.

Recommended elements for MDEQ investment under this topic therefore include development of:

1. A list of readily acceptable practices expected to generate credits
2. Selection, review and documentation of acceptable methods currently in use in Montana and/or elsewhere as they apply to potential credit-generating practices
3. Development of use protocols to ensure consistent application and interpretation of assumptions used in the calculation methods
4. Development of a standardized approach to calculate trade ratios
5. Training workshops for use and proper application of these methods

Numerous other methods, models and protocols exist from other trading programs that will bolster application of existing Montana calculation methods and/or provide options where these do not already exist. As such, recommended methods should be evaluated for their appropriate use and application in Montana, properly vetted and ultimately accepted for use by MDEQ. These could be provided for use in an appendix to DEQ-13 and be periodically updated as part of other ongoing development within other existing MDEQ program applications. Anticipated one-time MDEQ investment costs for these efforts would likely range from $75,000 - $125,000.

6.4.3 Defining Broker/Aggregator Roles

Bilateral trades are commonly executed through brokers and/or aggregators in existing WQT programs. These third party roles can simplify buyer needs for finding disaggregated NPS credits and facilitate a number of contractual and regulatory requirements of trades. Trading brokers typically negotiate with credit generators (e.g., landowners), can verify management practice installation and operation, and establish trading contracts between participating landowners and the buyers. They provide support for, but do not typically retain any contractual obligations with credit generation or maintenance of credits for a buyer. Such are the typical roles for credit aggregators.

A credit aggregator in PS/NPS trading programs is an entity that purchases credits from multiple nonpoint sources, and re-sells them to an interested buyer(s). The aggregating individual or entity finds, purchases, and compiles credits from multiple individual credit generators (typically NPSs) to bundle and sell to permitted facilities seeking trading credits. Credit aggregation in WQT programs is becoming an increasingly popular method for bolstering trading markets, particularly in easing access to the market for both nonpoint and point source participants. Aggregators are typically trusted purchasers of credits and can take much of the risk out of participation in nonpoint source credit generating projects, thereby encouraging participation in the market. Further, aggregators, often having already performed the work of collecting or securing credits from existing or proposed projects, make it much easier for point sources such as WWTPs looking to buy credits by purchasing a bundle of credits they need. By performing these roles, aggregators can reduce both costs and risks of participation in water quality trading markets.

Specific roles and duties of aggregators (and to a much lesser degree, of brokers) may include:

1. Understanding program policies, including approval processes and contracting standards
2. Understanding basic market factors, including the ability to undertake baseline and market viability analyses
3. Completing sales transactions, including comparative cost analyses, certification processes, market pricing discovery, regulatory sales approvals, negotiating contracts and working with verifiers
4. Entering into trading contracts, including scheduling payments, establishing prices and durations of trades, insuring credits in case of deficits, transferring civil contract liability, understanding monitoring and maintenance needs, and other program regulations
5. Funding and managing the project, including managing landowner payments and ensuring cash flow to cover implementation
6. Managing a diverse credit portfolio, including multiple generators and inherent structural differences
7. Assuming and managing market risks and insuring projects

Relevant benefits of these market participants, particularly aggregators, can include the following.

Reducing Risks:

Incorporating aggregators into WQT markets can reduce inherent market risks for credit generators and purchasers. This reduced risk results primarily from delinking contractual liability between regulated entities and unregulated nonpoint sources. Thus, the aggregator absorbs both delivery and performance risks, thereby easing buyer and seller access to markets. An aggregator's credit portfolio diversifies the quantity and character of projects while reserve credits absorb the risks of delivery or implementation failure.

Reducing Program Costs

Transaction costs tend to increase with the involvement of nonpoint sources. This is due in part to their broader spatial distribution, limited knowledge for credit generation capacity, and unfamiliarity or distrust of environment markets and/or regulations. Costs for buyers in settings with disaggregated NPS credits may therefore include site-specific project identification, contractor search and negotiation, management and policing of multiple contracts from a variety of sellers, and more.

Aggregators, however, can reduce capital costs through economies of scale. In an aggregated scheme, transaction costs are initially covered by the aggregator. Thus, point sources are not responsible for the costs of finding enough NPS credit generators to fulfill their demand needs, NPSs can work with a trusted entity, the aggregator, to more easily enter into market transactions. Though there are costs associated with using aggregators (who typically recoup all costs, including profit in the case of private sector aggregators) these should be relatively lower overall than expenses associated with a disaggregated system of credit purchases.

Easing Access to Trading

Just as aggregators and/or brokers can reduce program transaction costs, so do these roles ease access to trading. By helping a scattered group of smaller projects to function like on large project through credit bundling or buyer consolidaton, the typical barriers inhibiting investments into small projects are mitigated. This eases access for both NPS credit generators and point source offset purchasers, who no longer need to establish a relationship between one another.

As such, recommended elements for MDEQ investment under this topic include development of:

1. Establishment of MDEQ expectations and/or qualifications of potentially eligible brokers/aggregators
2. Development of protocols, documentation and reporting requirements for these third parties consistent with and in addition to above recommendations
3. Workshops to promote broker/aggregation opportunities in select watersheds where trading might be pursued, and to train potential third party interests in the use and application of established protocols.

There are a number of aggregators and functioning broker/aggregator models from other trading programs to allow for the sufficient development of MDEQ expectations of these potential roles in Montana. Any documentation prepared by MDEQ could remain as recommendations without any formal approval requirements, or be captured as an appendix to DEQ-13. As such, anticipated investment costs for these efforts are estimated at $25,000 - $45,000.

6.5 Business Case Summary

Based on analyses presented in this report, the market for nutrient trading in Montana appears to be thin. A limited number of WWTPs may find that the demand, supply and economic efficiencies of trading are suitable for their settings. These conditions will also vary over the next 20 years and corresponding four permit cycles. In such cases, trading may provide substantial cost savings over more expensive facility upgrades. Thus, this study recommends limited MDEQ investments to facilitate WQT by enhancing and standardizing opportunities that already exist under Montana trading policy. This study is not recommending MDEQ investment in more prescriptive requirements for development of a formal WQT framework to implement the policy.

Formal trading frameworks may be appropriate where higher trading volumes are anticipated. This is not necessarily the case in Montana. Bilateral trades within the context of the MPDES permit instrument and existing trading policy will be the most likely mechanism for such transactions. These can, however, be facilitated under the existing policy with standardization of information tracking, reporting and credit estimation methods, as well as clarification of roles for credit verifiers and third-party trading facilitation (i.e., aggregators and brokers). These efforts would provide consistency in trading policy applications for both buyers and MDEQ. They would also ease access to trading participation for buyers and sellers without unnecessarily creating long-term programmatic burdens on MDEQ. The Project Team recommends MDEQ consider one-time investment in supporting the development of these additional elements under existing trading policy.

These recommended investments are estimated to minimally range from $150,000-$220,000 assuming outside contractor assistance. Future obligations such as any annual public reporting by MDEQ of trading activity can be facilitated by development of a simple, spreadsheet-like registry as part of MDEQ investments. Associated annual costs would be recurrent if there was trading activity, though these could most likely be integrated into existing staff and related program responsibilities. Decision-making on protocols and participation in recommended workshops and outreach would require additional staff time commitments from MDEQ.

Overall, this investment strategy facilitates what will likely be limited trading through bilateral exchanges between buyers and sellers and/or buyers and aggregators. It eliminates the need for formal program development and management. Trading integrated into the existing permit process should be within the current purview of permit writers. Buyers and sellers will therefore bear the bulk of responsibilities for trading. Aggregators and/or brokers can negotiate their own contractual arrangements with buyers, though operating within consistent and recommended roles that would be set forth with additional MDEQ investments.

MDEQ investment at this time is not deemed as essential by the Project Team for future WWTP application and use of the trading policy. MDEQ investment in some or all of the recommended elements will simply help facilitate trades and reduce future costs associated with transactions and administration of potential trades. Fundamentally, all additional elements developed to facilitate trades under the existing policy, could be documented in appendices to DEQ-13, and readily integrated into existing MDEQ program functions.

APPENDIX A

LIST OF POINT SOURCE DISCHARGERS IN MONTANA
UNDER PERVUE OF MONTANA DEQ
and
DMR ANALYSIS SHEET FOR EACH DISCHARGER
FROM JANUARY 2010 THROUGH AUGUST 2014

List of All Montana Point Source Dischargers under MDEQ pervue with Nutrients in Effluent

(blue shaded, also astericked, discharges were removed from study - see text for explanation)

Large River Dischargers

NPDES ID	Description	Population	Latitude	Longitude	Effective Date	Expire Date	Design Flow	Actual Flow	Size	Type	HUC12 Watershed	Large River
MT0022586	BILLINGS	104,170	45.802500	-108.466944	11/1/2014	10/31/2019	26	15.8	Major	M	100700041006	Yellowstone
MT0021920	GREAT FALLS	58,505	47.519889	-111.300778	12/1/2010	11/30/2015	21	9.51	Major	M	100301021201	Missouri
MT0020001	MILES CITY	8,410	46.430550	-105.830900	4/1/2011	3/31/2016	1.98	1.16	Major	M	101000012602	Yellowstone
MT0020435*	LIVINGSTON	7,044	45.676389	-110.537500	11/1/2009	10/31/2014	2	1.048	Major	M	100700020504	Yellowstone
MT0020311	LAUREL	6,718	45.657500	-108.752222	7/1/2009	6/30/2014	0.5	0.92	Major	M	100700040602	Yellowstone
MT0030759*	HARDIN	3,505	45.735000	-107.581111	10/1/2011	9/30/2016	1	0.59	Major	M	100800150609	Big Horn
MT0020494*	LIBBY	2,628	48.376639	-115.556944	9/1/2009	8/31/2014	0.511	0.26	Major	M	170101011005	Kootenai
MT0020397	BIGFORK	4,270	48.063780	-114.083100	8/1/2010	7/31/2015	0.69	0.23	Major	M	170102080501	Flathead
MT0021628*	GLENDIVE	4,935	47.137222	-104.680000	12/1/2007	11/30/2012	1.9	0.23	Major	M	101000041208	Yellowstone
MT0000396*	CORETTE THERMAL PLANT		45.776230	-108.480850	4/1/2000	3/31/2005	131		Major		100700041006	Yellowstone
MT0000302*	MDU - LEWIS & CLARK PLANT		47.676080	-104.160820	12/1/2000	11/30/2005	42.43		Major		101000042209	Yellowstone
MT0028321*	EXXON MOBIL BILLINGS REFINERY SUCTION DREDGE		45.813904	-108.433295	6/1/2008	5/31/2013	5.86		Minor		100700070403	Yellowstone
MT0000477*	EXXONMOBIL REFINING & SUPPLY		45.813904	-108.433295	11/1/2003	10/31/2008	2.7		Major		100700070403	Yellowstone
MT0000256*	CONOCOPHILLIPS - BILLINGS REFINERY		45.776389	-108.484444	12/1/2009	11/30/2014	2.66		Major		100700041006	Yellowstone
MT0000264*	CENEX HARVEST STATES COOP.		45.659220	-108.767780	11/1/1999	4/30/2004	2.174		Major		100700040602	Yellowstone
MT0030180	YELLOWSTONE ENERGY LIMITED PARTNERSHIP FACILITY		45.813333	-108.440278	5/1/2014	4/30/2019	0.25		Minor		100700070403	Yellowstone
MT0030066*	COLUMBIA FALLS ALUMINUM CO		48.397778	-114.135556	9/1/2014	8/31/2019	0.6		Major		170102080102	Flathead
MT0000388*	MONTANA RAIL LINK -LIVINGSTON RAIL YARD		45.674444	-110.536111	9/1/2012	8/31/2017	0.14		Minor		100700020504	Yellowstone
MT0020664*	SUPERIOR	812	47.195667	-114.905528	7/1/2014	6/30/2019	0.187	0.034	Minor	L	170102040701	Clark Fork
MT0021555*	ALBERTON	420	47.003889	-114.484167	9/1/2013	8/31/2018	0.0793	0.12	Minor	L	170102040601	Clark Fork
MT0030465*	PLAINS	1,048	47.462880	-114.927490	10/1/2009	9/30/2014	0.217	0.106	Minor	L	170102130510	Clark Fork
MTG580035*	THOMPSON FALLS	1,313	47.594870	-115.357060	1/1/2013	12/31/2017	0.144	0.046	Minor	L	170102130902	Clark Fork
MT0020401*	THREE FORKS	1,869	45.898889	-111.523889	1/1/2009	12/31/2013	0.45	0.32	Minor	L	100200071505	Madison
MT0021601*	FORT BENTON	1,464	47.825556	-110.647778	10/1/2013	9/30/2018	0.26	0.13	Minor	L	100301021602	Missouri
MTG580019*	FORT PECK	233	48.017778	-106.441944	1/1/2013	12/31/2017	0.0475	0.0047	Minor	L	100600010102	Missouri
MTG580020*	TOWNSEND	1,878	46.329444	-111.535278	1/1/2013	12/31/2017	0.6	0.25	Minor	L	100301010906	Missouri
MT0020753*	BIG TIMBER	1,641	45.843056	-109.929167	5/1/2012	4/30/2017	0.39	0.07	Minor	L	100700020909	Yellowstone
MT0021288*	FORSYTH	1,777	46.276667	-106.658889	5/1/2014	4/30/2019	0.54	0.34	Minor	L	101000011202	Yellowstone
MT0021709*	HYSHAM	312	46.308889	-107.248056	1/1/2010	12/31/2014	0.1	0.011	Minor	L	101000010307	Yellowstone
MT0021849*	SIDNEY	5,191	47.697780	-104.113890	3/1/2014	2/28/2019	1.4	0.92	Major	L	101000042704	Yellowstone
MT0022705*	GARDINER	875	45.045361	-110.743528	8/1/2007	7/31/2012	0.23	0.26	Minor	L	100700010902	Yellowstone
MT0024783*	SAVAGE	75	47.455000	-104.331667	10/1/2013	9/30/2018	0.0195	0.041	Minor	L	101000042202	Yellowstone
MTG580007*	PARK CITY	983	45.622222	-108.891111	1/1/2013	12/31/2017	0.136	0.19	Minor	L	100700040601	Yellowstone
MTG580017*	TERRY	605	46.802680	-105.299190	1/1/2013	12/31/2017	0.171	0.0508	Minor	L	101000040305	Yellowstone
MTG580018*	COLUMBUS	1,893	45.624111	-109.232306	1/1/2013	12/31/2017	0.25	0.13	Minor	L	100700040401	Yellowstone
MTG580025*	FALLON	164	46.843056	-105.118611	1/1/2013	12/31/2017	0.03	0	Minor	L	101000040705	Yellowstone

Industrial Dischargers to Wadeable Streams

NPDES ID	Description	Population	Latitude	Longitude	Effective Date	Expire Date	Design Flow	Actual Flow	Size	Type	HUC12 Watershed
MT0000281	WESTERN SUGAR COOPERATIVE		45.770000	-108.500833	12/1/2009	11/30/2014	9.36		Major		100700041006
MT0000191*	MONTANA RESOURCES		46.007588	-112.501703	9/1/2012	8/31/2017	5.04		Major		170102010203
MT0000230*	MONTANA SULPHUR & CHEMICAL CO		45.813530	-108.428100	4/1/2014	3/31/2019	3.3		Minor		100700070403
MT0000884*	BIG SKY COAL COMPANY - BIG SKY MINE		45.800833	-106.666667	7/1/2011	6/30/2016	3.05		Minor		101000020302
MT0030724*	FIDELITY - TONGUE RIVER PROJECT WTF		45.004944	-106.827889	11/14/2010	11/13/2015	2.44		Minor		100901010301
MT0029891*	BARRETTS MINERALS INC		45.229444	-112.308333	6/1/2014	5/31/2019	1.6		Minor		100200020604
MT0000248*	SIDNEY SUGARS INCORPORATED		47.717500	-104.120278	12/1/2009	11/30/2014	1.3		Major		101000042704
MT0030350*	REC ADVANCED SILICON MATERIALS LLC		45.972611	-112.689750	11/1/2010	10/31/2015	1.15		Minor		170102010205
MT0000892*	DECKER COAL CO (WEST MINE)		45.053728	-106.822055	5/1/2012	4/30/2017	1.12		Major		100901010501
MT0024716*	STILLWATER MINING COMPANY		45.381052	-109.877124	11/1/2008	10/31/2013	0.94		Minor		100700050204
MT0024210*	DECKER COAL CO (EAST MINE)		45.063630	-106.785930	5/1/2012	4/30/2017	0.89		Major		100901010501

MT0026808	STILLWATER MINING COMPANY		45.502500	-110.083889	8/1/2000	7/31/2005	0.648		Minor		100700020701	
MT0023604*	WESTMORELAND SAVAGE CORP - SAVAGE MINE		47.471100	-104.427250	2/1/2011	1/31/2016	0.576		Minor		101000042202	
MT0028983*	BULL MOUNTAIN MINE #1		46.272810	-108.423520	5/1/2013	4/30/2018	0.36		Minor		100402012201	
MT0031593*	JAMES GUERCIO - OW RANCH		45.136278	-106.476250	2/1/2011	1/31/2016	0.19		Minor		100901010703	
MT0030147*	ASARCO INC		46.581660	-111.918300	8/1/2010	7/31/2015	0.14		Minor		100301011310	
MT0027821*	BEAVERHEAD TALC MINE		45.210446	-112.344642	1/1/2007	12/31/2011	0.1		Minor		100200020604	
MT0021431	MT BEHAVIORAL HEALTH INC WWTP		46.237222	-112.776528	8/1/2012	7/31/2017	0.1		Minor		170102010405	
MT0000019*	BN WHITEFISH FACILITY		48.411944	-114.344167	11/1/2009	10/31/2014	0.1		Minor		170102100508	
MT0023639*	BOULDER HOT SPRINGS WWTP		46.200330	-112.093910	8/1/2009	7/31/2014	0.1		Minor		100200060402	
MT0023566	ELKHORN HEALTH CARE WWTP		46.449444	-111.985278	11/1/2009	10/31/2014	0.02		Minor		100301011303	
Municipal Dischargers to Wadeable Streams > 1,000 populatioin												**Disharge**
NPDES ID	**Description**	**Population**	**Latitude**	**Longitude**	**Effective Date**	**Expire Date**	**Design Flow**	**Actual Flow**	**Size**	**Type**	**HUC12 Watershed**	**Months/Yr**
MT0022594	MISSOULA	66,788	46.874160	-113.994600	11/1/2006	10/31/2011	8.99	7.06	Major	M	170102040104	12
MT0022608	BOZEMAN	37,280	45.722778	-111.067778	6/1/2012	5/31/2017	5.784	5.546	Major	M	100200081301	12
MT0022012	BUTTE	33,525	45.996960	-112.553600	4/1/2012	3/31/2017	8.5	3.784	Major	M	170102010204	12
MT0022641	HELENA	28,190	46.619167	-112.005000	10/1/2012	9/30/2017	6	3.06	Major	M	100301011310	12
MT0021938	KALISPELL	19,927	48.176690	-114.309360	9/1/2008	8/31/2013	5.4	2.7	Major	M	170102080208	12
MT0020044	LEWISTOWN	5,901	47.064060	-109.424980	9/1/2012	8/31/2017	2.83	1.87	Major	M	100401030706	12
MT0022535	HAVRE	9,310	48.559444	-109.662500	5/1/2011	4/30/2016	1.8	1.55	Major	M	100500040404	12
MT0020028	HAMILTON	4,348	46.253300	-114.175790	9/1/2011	8/31/2016	1.984	0.642	Major	M	170102051007	12
MT0020036*	COLUMBIA FALLS	4,688	48.356111	-114.214167	5/1/2010	4/30/2015	0.55	0.415	Minor	M	170102080103	12
MT0022713*	STEVENSVILLE	1,809	46.511940	-114.104440	7/1/2012	6/30/2017	0.35	0.421	Minor	M	170102051305	12
MT0022560	EAST HELENA	1,984	46.589460	-111.921020	10/1/2009	9/30/2014	0.631	0.372	Minor	M	100301011310	12
MT0021458	DILLON	4,134	45.230556	-112.618611	3/1/2010	2/28/2015	1.1	0.361	Major	M	100200020603	12
MT0020168	LOLO	3,892	46.774670	-114.070210	8/1/2007	7/31/2012	0.25	0.213	Minor	M	170102051603	12
MT0020079	CONRAD	2,570	48.204444	-111.919167	2/1/2012	1/31/2017	0.65	0.169	Minor	M	100302030705	12
MT0021857	MANHATTAN	1,520	45.877080	-111.332420	9/1/2010	8/31/2015	0.4	0.132	Minor	M	100200081401	12
MT0022616	DEER LODGE	3,111	46.429167	-112.739167	3/1/2013	2/28/2018	2.4	1.27	Major	(M)	170102010707	12
MT0020478	RED LODGE	2,125	45.213389	-109.240861	3/1/2009	2/28/2014	0.285	0.59	Minor	L	100700060906	12
MT0021211*	GLASGOW	3,250	48.180278	-106.624167	9/1/2013	8/31/2018	1	0.39	Minor	L	100500121001	12
MT0021750	ABSAROKEE	1,150	45.531111	-109.440000	2/1/2010	1/31/2015	0.35	0.256	Minor	L	100700050406	12
MT0020052*	CHOTEAU	1,684	47.795556	-112.178333	12/1/2010	11/30/2015	0.3	0.466	Minor	(M)	100302050401	12
MT0031488*	SHELBY	3,376	48.483333	-111.834722	5/1/2014	4/30/2019	0.357	0.15	Minor	L	100302030802	9
MTG580032*	EUREKA	1,037	48.890556	-115.080833	1/1/2013	12/31/2017	0.35	0.075	Minor	L	170101010306	9
MT0023078*	BOULDER	1,183	46.224722	-112.103333	3/1/2010	2/28/2015	0.2	0.085	Minor	(M)	100200060503	12
MT0027430	ROCKER	100	46.004167	-112.623611	6/1/2013	5/31/2018	0.035	0.022	Minor	M	170102010204	12
MT0020656*	HINSDALE	217	48.396667	-107.083056	8/1/2012	7/31/2017	0.03	0.017	Minor	M	100500120401	12
MT0030295*	ROUNDUP	1,788	46.446389	-108.521944	11/1/2013	10/31/2018	0.35	0.09	Minor	L	100402020401	0
MT0020141*	CUT BANK	2,869	48.657222	-112.309722	3/1/2012	2/28/2017	0.64	0.075	Minor	L	100302020704	4
MTG580029*	BAKER	1,741	46.368720	-104.307830	1/1/2013	12/31/2017	0.35	0.011	Minor	L	101000050501	2
MT0020389*	MALTA	1,997	48.373333	-107.854444	6/1/2010	5/31/2015	0.37	0	Minor	L	100500041901	0
MT0020133*	WHITEHALL	1,038	45.859306	-112.075278	3/1/2009	2/28/2014	0.251	0	Minor	L	100200050204	0
Municipal Dischargers to Wadeable Stream < 1,000 population												
NPDES ID	**Description**	**Population**	**Latitude**	**Longitude**	**Effective Date**	**Expire Date**	**Design Flow**	**Actual Flow**	**Size**	**Type**	**HUC12 Watershed**	
MT0030732*	ENNIS	838	45.354722	-111.715833	5/1/2014	4/30/2019	0.1	0.23	Minor	L	100200071205	
MTG580004*	MSH / WARM SPRINGS	980	46.185556	-112.777222	1/1/2013	12/31/2017	0.19	0.18	Minor	L	170102010401	
MT0020354*	HARLOWTON	997	46.425417	-109.799167	10/1/2009	9/30/2014	0.3	0.17	Minor	L	100402011003	
MT0020699*	WHITE SULPHUR SPRINGS	939	46.539722	-110.917500	5/1/2007	4/30/2012	0.18	0.102	Minor	L	100301030206	
MT0031500*	PHILIPSBURG	820	46.348056	-113.317500	8/1/2007	7/31/2012	0.16	0.077	Minor	L	170102020202	
MTG580011*	DARBY	720	46.020790	-114.177770	1/1/2013	12/31/2017	0.15	0.063	Minor	L	170102050806	
MT0020303*	BRIDGER	708	45.295556	-108.900278	8/1/2010	7/31/2015	0.124	0.058	Minor	L	100700060801	
MTG580016*	GERALDINE	261	47.600300	-110.253810	1/1/2013	12/31/2017	0.116	0.058	Minor	L	100401020503	
MT0021270*	HARLEM	808	48.502778	-108.793056	1/1/2013	12/31/2017	0.11	0.057	Minor	L	100500041302	
MTG580003*	FAIRFIELD	708	47.624167	-111.997778	1/1/2013	12/31/2017	0.11	0.056	Minor	L	100302050402	

MT0020249*	JOLIET	595	45.485556	-108.956250	9/1/2007	8/31/2012	0.62	0.054	Minor	L	100700060908	
MT0021571*	BELT	597	47.393500	-110.922306	9/1/2011	8/31/2016	0.155	0.035	Minor	L	100301050401	
MT0022462*	DENTON	255	47.322778	-109.933333	8/1/2010	7/31/2015	0.05	0.034	Minor	L	100401031204	
MT0020796*	CIRCLE	615	47.421944	-105.572778	8/1/2010	7/31/2015	0.071	0.032	Minor	L	100600020505	
MT0022454*	BIG SANDY	598	48.182500	-110.100556	7/1/2012	6/30/2017	0.9	0.032	Minor	L	100500050203	
MT0021792*	VALIER	509	48.315472	-112.239389	3/1/2010	2/28/2015	0.144	0.024	Minor	L	100302030102	
MTG580015*	BROADUS	468	45.449444	-105.397778	1/1/2013	12/31/2017	0.1	0.024	Minor	L	100902070306	
MT0021385*	JORDAN	343	47.316944	-106.886111	10/1/2011	9/30/2016	0.0465	0.017	Minor	L	100401050901	
MT0022080*	HIGHWOOD	176	47.585833	-110.810556	11/1/2010	10/31/2015	0.0258	0.016	Minor	L	100301021304	
MTG580033*	FROMBERG	438	45.395833	-108.901667	1/1/2013	12/31/2017	0.072	0.009	Minor	L	100700060801	
MT0030091*	STOCKETT	169	47.370278	-111.158889	9/1/2010	8/31/2015	0.034	0.005	Minor	L	100301020902	
MTG580034*	NASHUA	290	48.124167	-106.354167	1/1/2013	12/31/2017	0.05	0.0037	Minor	L	100500121002	
MTG580024*	MEDICINE LAKE	225	48.496920	-104.510170	1/1/2013	12/31/2017	0.045	0.0032	Minor	L	100600061306	
MT0020702*	WINNETT	182	47.009167	-108.343611	5/1/2012	4/30/2017	0.12	0.00305	Minor	L	100402040604	
MTG580012*	SACO	197	48.456519	-107.342432	1/1/2013	12/31/2017	0.067	0.0017	Minor	L	100500140704	
MT0020338*	CHESTER	847	48.500806	-110.962000	8/1/2011	7/31/2016	0.168	0	Minor	L	100302031703	
MT0020516*	WIBAUX	589	46.994722	-104.184444	6/1/2012	5/31/2017	0.07	0	Minor	L	101102040207	
MT0022161*	STANFORD	401	47.155278	-110.199444	11/1/2009	10/31/2014	0.06	0	Minor	L	100401031202	
MT0021679*	SUNBURST	375	48.868056	-111.896667	11/1/2012	10/31/2017	0.051	0	Minor	L	100302030204	
MTG580023*	DUTTON	316	47.850083	-111.701389	1/1/2013	12/31/2017	0.07	0	Minor	L	100302050904	
MTG580002*	DRUMMOND	309	46.678056	-113.185278	1/1/2013	12/31/2017	0.075	0	Minor	L	170102020602	
MT0021636*	HOBSON	215	47.001944	-109.865833	11/1/2012	10/31/2017	0.039	0	Minor	L	100401030509	
MT0025038*	WILLOW CREEK	210	45.829667	-111.642417	9/1/2012	8/31/2017	0.03	0	Minor	L	100200050805	
MT0031453*	WINIFRED	208	47.565944	-109.374278	4/1/2012	3/31/2017	0.02	0	Minor	L	100401010504	
MTG580013*	LAVINA	187	46.290278	-108.929444	1/1/2013	12/31/2017	0.0216	0	Minor	L	100402012304	
MTG580028*	FROID	185	48.330833	-104.499722	1/1/2013	12/31/2017	0.04	0	Minor	L	100600061604	
MT0030244*	KEVIN	154	48.748667	-111.959472	10/1/2011	9/30/2016	0.03	0	Minor	L	100302030304	
MTG580022*	BRADY	140	48.043611	-111.842778	1/1/2013	12/31/2017	0.02	0	Minor	L	100302031001	
MT0030309*	GRASS RANGE	110	47.043889	-108.810000	9/1/2011	8/31/2016	0.04	0	Minor	L	100402040405	
MTG580026*	OUTLOOK	96	48.876111	-104.761389	1/1/2013	12/31/2017	0.012	0	Minor	L	100600060501	
MT0031437*	SWEET GRASS	75	48.995556	-111.953333	11/1/2010	10/31/2015	0.021	0	Minor	L	100302030201	
*Removed from study, see text for explanation												

Miles City WWTP				MT0020001
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.91	1.09		2.92
02/28/2010	1.02	1.13		2.43
03/31/2010	1.12	1.24		2.44
04/30/2010	1.13	1.29		1.37
05/31/2010	1.28	2.23		2.79
06/30/2010	1.35	1.61		2.36
07/31/2010	1.32	1.73		2.16
08/31/2010	1.26	1.36		2.53
09/30/2010	1.24	1.35		2.23
10/31/2010	1.1	1.27		3.08
11/30/2010	1.02	1.08		3.25
12/31/2010	1.07	1.14		2.4
01/31/2011	1.11	1.29		2.4
02/28/2011	1.07	1.35		2.38
03/31/2011	1.18	1.55		2.39
04/30/2011	1.26	2.23	21.5	2.3
05/31/2011	1.96	3.22	14.2	1.01
06/30/2011	2.12	2.39	16.3	1.25
07/31/2011	1.82	20.5	15.9	1.76
08/31/2011	1.44	1.55	16.1	2.05
09/30/2011	1.25	1.35	20.9	2.27
10/31/2011	1.13	1.27	27.7	2.34
11/30/2011	1.04	1.12	26.2	2.17
12/31/2011	0.97	1.05	23.8	2.19
01/31/2012	0.92	1.02	24.9	1.94
02/29/2012	1	1.15	24.9	2.67
03/31/2012	1.02	1.08	25.4	2.7
04/30/2012	0.97	1.05	24.8	2.5
05/31/2012	0.94	1.06	27.4	2.96
06/30/2012	1	1.11	26	2.7
07/31/2012	1.05	1.48	13.3	2.3
08/31/2012	1.02	1.11	22.1	2.89
09/30/2012	0.96	1.04	28.7	3.68
10/31/2012	0.91	0.97	36.6	3.28
11/30/2012	0.86	0.93	26.7	2.5
12/31/2012	0.88	0.96	29.6	2.8
01/31/2013	0.92	0.95	34.9	3
02/28/2013	0.93	0.98	29.9	2.1
03/31/2013	0.94	1	35.3	3.14
04/30/2013	0.97	1.08	32	2.8
05/31/2013	1.13	1.9	29.6	3.08
06/30/2013	1.18	1.38	23.7	2.15
07/31/2013	1.14	1.32	21.9	2.45
08/31/2013	1.17	1.28	15.4	2.5
09/30/2013	1.09	1.28	27.7	2.93
10/31/2013	0.99	1.07	29.5	3.38
11/30/2013	0.98	1.04	25.3	2.78
12/31/2013	0.98	1.06	9.1	2.62
01/31/2014	1.03	1.25	23.2	2.08
02/28/2014	1.08	1.23	11.1	2.44
03/31/2014	1.25	1.42	24.1	2.74
04/30/2014	1.21	1.37	22.8	2.32
05/31/2014	1.17	1.53	22.2	2.36
06/30/2014	1.23	1.64	19.1	2.18
07/31/2014	1.22	1.29	20.2	2.71
08/31/2014	1.13	1.42	22.2	2.82
Average	**1.133**	**1.676**	**23.712**	**2.499**
Median	**1.085**	**1.270**	**24.100**	**2.445**
90th Percentile	**1.300**	**1.815**	**29.900**	**3.080**
Summer Ave.	**1.222**	**2.719**	**20.400**	**2.520**
Population	8,410	Influent->	29.4	7.00
	135	216	18%	65%
	gpcd ave	gpcd max	removal	removal

Lolo WWTP				MT0020168
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.23	0.32	26.1	6.19
02/28/2010	0.22	0.26	27.3	4.28
03/31/2010	0.22	0.3	21.4	4.41
04/30/2010	0.22	0.28	22	4.01
05/31/2010	0.22	0.25	25.6	4.55
06/30/2010	0.19	0.27	26.9	5.95
07/31/2010	0.2	0.28	26.9	5.64
08/31/2010	0.2	0.22	22	5.32
09/30/2010	0.21	0.23	20.5	4.73
10/31/2010	0.22	0.23	17.8	3.95
11/30/2010	0.24	0.26	20.3	3.89
12/31/2010	0.25	0.27	20.1	4.5
01/31/2011	0.23	0.27	20.7	3.5
02/28/2011	0.23	0.25	19.8	3.3
03/31/2011	0.21	0.28	21.9	3.93
04/30/2011	0.2	0.24	21.8	1.36
05/31/2011	0.25	0.31	20.7	2.29
06/30/2011	0.26	0.35		2.5
07/31/2011	0.23	0.27		3.94
08/31/2011	0.21	0.36		6.9
09/30/2011	0.21	0.31		6.26
10/31/2011	0.22	0.27	28.4	8.21
11/30/2011	0.22	0.31	19.3	2.76
12/31/2011	0.23	0.26	20.4	2.19
01/31/2012	0.24	0.35	27.3	5.38
02/29/2012	0.25	0.33	23.4	4.75
03/31/2012	0.23	0.26	26.7	3.35
04/30/2012	0.22	0.26	28	3.83
05/31/2012	0.22	0.26	29.9	4.35
06/30/2012	0.23	0.25		5.06
07/31/2012	0.22	0.27		4.38
08/31/2012	0.2	0.23		4.28
09/30/2012	0.21	0.23		4.35
10/31/2012	0.02	0.25	27.1	5.18
11/30/2012	0.2	0.22	26.7	3.71
12/31/2012	0.21	0.24	26.05	4.4
01/31/2013	0.21	0.23	26.88	3.47
02/28/2013	0.2	0.24	25.3	4.35
03/31/2013	0.2	0.32	28.93	6.01
04/30/2013	0.2	0.22	31.18	3.98
05/31/2013	0.21	0.25	28.9	4.38
06/30/2013	0.21	0.28		4.94
07/31/2013	0.2	0.32		5.72
08/31/2013	0.19	0.23		4.31
09/30/2013	0.25	0.35		4.97
10/31/2013	0.22	0.26	28.3	4.28
11/30/2013	0.2	0.23	29.23	4.08
12/31/2013	0.2	0.29	27.4	5.94
01/31/2014	0.19	0.22	27.8	5
02/28/2014	0.22	0.25	27.9	4.22
03/31/2014	0.25	0.32	23.13	4.33
04/30/2014	0.2	0.25	22.46	4.18
05/31/2014	0.21	0.22	24.25	3.63
06/30/2014	0.2	0.27		6.23
07/31/2014	0.17	0.21		2.94
08/31/2014	0.22	0.28		1.03
Average	**0.213**	**0.269**	**24.798**	**4.385**
Median	**0.215**	**0.260**	**26.050**	**4.340**
90th Percentile	**0.245**	**0.320**	**28.900**	**5.980**
Summer Ave.	**0.209**	**0.271**	**23.133**	**4.626**
Population	3,892	Influent->	35.0	7.00
	55	82	26%	38%
	gpcd ave	gpcd max	removal	removal

Havre WWTP				MT0022535
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
	Ave	Max	(mg/l)	(mg/l)
01/31/2010	1.02	1.22		2.33
02/28/2010	1	1.12		2.46
03/31/2010	1.04	1.15		2.29
04/30/2010	1.03	1.35		2.86
05/31/2010	1.13	1.59		3.35
06/30/2010	1.3	2.2		2.48
07/31/2010	1.29	1.43		2.16
08/31/2010	1.33	1.54		1.7
09/30/2010	1.41	1.68		2.1
10/31/2010	1.34	1.44		2.71
11/30/2010	1.58	1.62		2.86
12/31/2010	1.47	1.63		1.59
01/31/2011	1.46	2.25		1.56
02/28/2011	1.62	2.73		1.13
03/31/2011	1.65	2.07		1.05
04/30/2011	1.78	1.86		0.82
05/31/2011	1.91	2.63	16.8	1.31
06/30/2011	2.52	3.59	14.2	1.34
07/31/2011	1.98	2.1	14.6	1.57
08/31/2011	1.77	1.92	13.1	1.59
09/30/2011	1.63	1.75	15	2.3
10/31/2011	1.58	1.64	21.4	2.57
11/30/2011	1.55	1.63	18.3	2.3
12/31/2011	1.45	1.54	17.2	1.84
01/31/2012	1.4	1.46	16.5	1.66
02/29/2012	1.38	1.45	17.2	1.4
03/31/2012	1.4	1.62	14.63	1.72
04/30/2012	1.47	1.93	13.45	1.54
05/31/2012	1.6	2.29	16.2	1.83
06/30/2012	1.73	2.03	14.3	1.49
07/31/2012	1.62	1.79	17.2	2
08/31/2012	1.46	1.67	17.8	2.3
09/30/2012	1.37	1.43	18.8	2.51
10/31/2012	1.36	1.5	17.7	2.3
11/30/2012	1.32	1.37	14.6	2.2
12/31/2012	1.27	1.39	16.5	1.97
01/31/2013			19.2	1.69
02/28/2013	1.46	2.04	19.9	2.13
03/31/2013	1.19	1.31	21.4	2.1
04/30/2013	1.31	1.42	20.6	2.12
05/31/2013	1.5	3.07	17.45	1.86
06/30/2013	2.33	4.53	12	1.27
07/31/2013	2.08	2.52	12.4	1.26
08/31/2013	2.15	2.68	14.6	1.6
09/30/2013	1.94	2.13	15.1	1.81
10/31/2013	1.86	1.99	12.9	1.71
11/30/2013	1.65	1.81	16.6	1.92
12/31/2013	1.61	1.89	15.2	1.59
01/31/2014	1.6	1.93	17.2	1.68
02/28/2014	1.55	1.73	18.3	1.82
03/31/2014	1.57	1.8	19	1.88
04/30/2014	1.64	1.75	16.42	1.59
05/31/2014	1.65	1.79	14.5	1.61
06/30/2014	1.63	2.03	13.31	1.84
07/31/2014	1.51	1.67	12.75	1.84
08/31/2014	1.56	2.46	14	1.87
Average	**1.546**	**1.894**	**16.208**	**1.900**
Median	**1.550**	**1.750**	**16.460**	**1.840**
90th Percentile	**1.928**	**2.586**	**19.270**	**2.495**
Summer Ave.	**1.650**	**1.912**	**15.032**	**1.901**
Population	9,310	Influent->	23.8	6.50
	166	278	31%	72%
	gpcd ave	gpcd max	removal	removal

Bigfork WWTP				MT0020397
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.16	0.24		0.13
02/28/2010	0.15	0.18		0.11
03/31/2010	0.15	0.18	18.02	0.13
04/30/2010	0.16	0.22		0.17
05/31/2010	0.19	0.27		0.11
06/30/2010	0.3	0.41	17.76	0.12
07/31/2010	0.34	0.41		0.14
08/31/2010	0.32	0.39	16.6	0.08
09/30/2010	0.26	0.31	14.8	0.12
10/31/2010	0.2	0.23	13.5	0.17
11/30/2010	0.19	0.23	15.4	0.19
12/31/2010	0.18	0.25	16.3	0.1
01/31/2011	0.19	0.37	15.6	0.06
02/28/2011	0.18	0.3	15.68	0.1
03/31/2011	0.17	0.22	16.2	0.1
04/30/2011	0.17	0.19	20.14	0.06
05/31/2011	0.2	0.25	13.8	0.06
06/30/2011	0.29	0.37	15.77	0.12
07/31/2011	0.34	0.38	15.07	0.18
08/31/2011	0.31	0.04	16.31	0.14
09/30/2011	0.26	0.31	15.94	0.08
10/31/2011	0.22	0.34	14.21	0.06
11/30/2011	0.18	0.21	14.74	0.08
12/31/2011	0.16	0.18	16.41	0.1
01/31/2012	0.16	0.19	17.5	0.15
02/29/2012	0.16	0.22	16.3	0.09
03/31/2012	0.16	0.21	17.4	0.24
04/30/2012	0.18	0.2	8	0.21
05/31/2012	0.21	0.25	7.37	0.84
06/30/2012	0.33	0.4	6.44	0.48
07/31/2012	0.33	0.38	8.22	0.24
08/31/2012	0.31	0.35	9.48	0.3
09/30/2012	0.25	0.29	8.54	0.42
10/31/2012	0.22	0.24	12.67	0.6
11/30/2012	0.19	0.29	12.61	0.43
12/31/2012	0.18	0.2	11.6	0.2
01/31/2013	0.17	0.19	12.83	0.18
02/28/2013	0.16	0.19	15.97	0.21
03/31/2013	0.15	0.18	15.66	0.27
04/30/2013	0.16	0.19	16.31	0.27
05/31/2013	0.2	0.3	18.01	0.5
06/30/2013	0.27	0.33	14.59	0.68
07/31/2013	0.32	0.38	8.72	0.8
08/31/2013	0.32	0.36	7.65	0.67
09/30/2013	0.26	0.35	9.05	0.67
10/31/2013	0.22	0.27	11.38	0.58
11/30/2013	0.18	0.2	14.32	0.61
12/31/2013	0.18	0.2	18.05	0.7
01/31/2014	0.12	0.21	17.97	0.29
02/28/2014	0.17	0.23	8.33	0.27
03/31/2014	0.2	0.37	17.23	0.38
04/30/2014	0.17	0.18	12.33	0.68
05/31/2014	0.21	0.26	11.31	0.85
06/30/2014	0.33	0.48	7.03	0.42
07/31/2014	0.35	0.45	7.34	0.74
08/31/2014	0.31	0.34	8.87	0.77
Average	**0.221**	**0.274**	**13.555**	**0.312**
Median	**0.195**	**0.250**	**14.740**	**0.205**
90th Percentile	**0.325**	**0.385**	**17.760**	**0.690**
Summer Ave.	**0.306**	**0.339**	**11.276**	**0.382**
Population	4,270	Influent->	35.0	7.00
	52	90	58%	97%
	gpcd ave	gpcd max	removal	removal

Great Falls WWTP				MT0021920
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010				
02/28/2010				
03/31/2010	9.54	15.4	21.9	1.96
04/30/2010	9.89	22	23.2	0.91
05/31/2010	10.67	40.8	19.7	1.8
06/30/2010				
07/31/2010	11.43	25.8	12.5	1.4
08/31/2010	11.09	39.9	18.3	2.5
09/30/2010	10.78	21.4	14	2.94
10/31/2010	10.59	18.7	14.6	2.77
11/30/2010	9.97	16.6	24	2.71
12/31/2010	10.08	19.9	23.8	2.5
01/31/2011	10.17	19.8	22.7	1.4
02/28/2011	10.19	21.9	24.5	1.1
03/31/2011	10.33	20.1	28.3	1.3
04/30/2011	11.42	22.4	27.1	1.3
05/31/2011	13.35	34.1	18.4	9.4
06/30/2011	16.68	33.4	14.5	1.3
07/31/2011	13.16	23.6	18	1.7
08/31/2011	12.15	20	11.1	2.1
09/30/2011	9.8	16.6	18.6	2.3
10/31/2011	10.25	28	16.5	2.2
11/30/2011	9.6	16.7	13.6	4.5
12/31/2011	9.8	16.3	24.2	2.9
01/31/2012	9.2	19.4	29	1.5
02/29/2012	8.54	16	29.5	2.2
03/31/2012	8.79	9.53	8	2.4
04/30/2012	8.97	11.2	26.6	2.1
05/31/2012	9.29	12.78	26.2	1.3
06/30/2012	9.8	11.64	3.5	1.9
07/31/2012	10.41	16.58	14.3	2.2
08/31/2012	10.33	11.11	15.7	2.9
09/30/2012	9.52	10.73	21.7	2.9
10/31/2012	9.26	12.42	24.9	2
11/30/2012	9.42	10.16	24.3	1.3
12/31/2012	8.93	10.07	22	2.2
01/31/2013	8.69	9.33	16.4	1.9
02/28/2013	8.58	9.25	32.9	2.5
03/31/2013	8.16	9.06	26.8	2.5
04/30/2013	8.59	8.59	28.9	3.2
05/31/2013	9.42	15.34	20.7	1.8
06/30/2013	11.05	17.25	11.1	2.6
07/31/2013	10.51	12.23	16.5	3.2
08/31/2013	10.51	13.29	12.3	2.4
09/30/2013	10.08	11.48	8	3
10/31/2013	9.14	9.61	9.1	2.5
11/30/2013	8.24	9.66	14.4	2.9
12/31/2013	8.59	9.43	22.4	0.23
01/31/2014	8.22	8.89	23	2.6
02/28/2014	7.99	9.92	21.3	2.5
03/31/2014	8.75	10.86	23	2.2
04/30/2014	8.8	10.59	18.3	1.9
05/31/2014	8.84	10.08	19.7	2.3
06/30/2014	10.96	14.92	18.1	2.7
07/31/2014	10.49	12.6	10.4	2.1
08/31/2014	12.05	24.12	11	1.1
Average	**10.020**	**16.632**	**19.236**	**2.302**
Median	**9.800**	**15.340**	**19.700**	**2.200**
90th Percentile	**11.428**	**25.464**	**27.040**	**2.932**
Summer Ave.	**10.879**	**18.531**	**14.457**	**2.339**
Population	58,505	Influent->	23.1	6.30
	171	435	15%	65%
	gpcd ave	gpcd max	removal	removal

Billings WWTP				MT0022586
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	13.7	14.8	12.7	2.7
02/28/2010	13.3	14.2	13.2	2.8
03/31/2010	13.2	15	16.2	2.6
04/30/2010	13.4	14.5	15.3	2.8
05/31/2010	15.7	19.1	13.9	2.4
06/30/2010	19	26.5	13.2	1.8
07/31/2010	18.5	20.4	11.6	1.7
08/31/2010	19	23.5	12.2	1.4
09/30/2010	19	21.2	11.4	1.2
10/31/2010	16.7	18.2	13.8	1.7
11/30/2010	15	15.6	13.7	2
12/31/2010	15	16.3	15	2.6
01/31/2011	14.6	15	13.9	1.9
02/28/2011	14.3	15.9	16.1	2.4
03/31/2011	13.7	14.3	13.7	2.3
04/30/2011	14.3	16.3	15.1	2.4
05/31/2011	21.3	39.6	9.4	1.8
06/30/2011	20.5	22.9	13.4	1.4
07/31/2011	18	20	14.7	1.5
08/31/2011	17.4	19.8	12	1.5
09/30/2011	15.9	17	11.7	1.6
10/31/2011	15.2	18.8	10.3	1.3
11/30/2011	14.3	15.8	12.8	1.4
12/31/2011	13.4	14.8	15.5	2
01/31/2012	12.5	13.4	15.1	1.9
02/29/2012	12.2	13	16.1	2.1
03/31/2012	12.2	13.9	13.8	2.3
04/30/2012	12.1	13.6	17.6	2.9
05/31/2012	13.6	16.6	18.1	2.6
06/30/2012	15.7	17	16.2	1.9
07/31/2012	16	17.5	11.4	1.8
08/31/2012	15.8	16.7	13.1	2.6
09/30/2012	14.9	16.4	11.2	2.7
10/31/2012	14.7	16.4	10.8	2.4
11/30/2012	13	14	10.7	2.8
12/31/2012	12	13	12.5	2.1
01/31/2013	11.8	13.2	18.2	2.8
02/28/2013	11.8	12.8	20.6	2.9
03/31/2013	11.6	13.6	18.9	2.5
04/30/2013	11.6	12.4	15	2.34
05/31/2013	13.8	20	15.8	2.78
06/30/2013	16	17.3	11.9	1.97
07/31/2013	16.3	18.5	13.9	2.09
08/31/2013	16.1	17	17.3	2.33
09/30/2013	17.2	23.2	11.7	1.77
10/31/2013	17.1	22.4	12	1.85
11/30/2013	13.6	15.4	15.3	2.18
12/31/2013	13.4	14.8	18.4	2.18
01/31/2014	13.3	15.6	18.8	1.94
02/28/2014	13.5	16.9	23.7	2.16
03/31/2014	15.9	17.8	21.4	3.1
04/30/2014	15.3	18	21.2	1.78
05/31/2014	15.4	17.2	20.7	1.24
06/30/2014	17.9	20.4	17.6	1.55
07/31/2014	17	18.5	12.8	1.78
08/31/2014	18.4	21.3	14.4	1.97
Average	**15.109**	**17.452**	**14.768**	**2.116**
Median	**14.950**	**16.650**	**13.900**	**2.095**
90th Percentile	**18.450**	**21.850**	**18.850**	**2.800**
Summer Ave.	**17.107**	**19.357**	**12.814**	**1.853**
Population	104,170	Influent->	27.3	7.00
	145	210	49%	70%
	gpcd ave	gpcd max	removal	removal

0010922

Hamilton WWTP				MT0020028
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.55			
02/28/2010	0.56			
03/31/2010	0.54			
04/30/2010	0.53			
05/31/2010	0.57			
06/30/2010	0.76			
07/31/2010	0.82			
08/31/2010	0.69			
09/30/2010	0.58			
10/31/2010	0.52			
11/30/2010	0.5			
12/31/2010	0.51			
01/31/2011	0.53			
02/28/2011	0.52			
03/31/2011	0.54			
04/30/2011	0.54			
05/31/2011	0.57			
06/30/2011	0.65			
07/31/2011	0.74			
08/31/2011	0.72			
09/30/2011	0.75	0.78	11	4.8
10/31/2011	0.73	0.82	4.1	4.3
11/30/2011	0.66	0.7	5.7	4.9
12/31/2011	0.58	0.64	4.2	3.2
01/31/2012	0.58	0.67	5	5.7
02/29/2012	0.58	0.63	5.8	4.55
03/31/2012	0.57	0.66	6.44	5.5
04/30/2012	0.57	0.7	5.23	5.98
05/31/2012	0.58	0.68	6.56	8.6
06/30/2012	0.67	0.73	4.9	6.08
07/31/2012	0.75	0.85	3.65	4.56
08/31/2012	0.79	0.88	3.36	5.23
09/30/2012	0.8	0.94	7.83	5.55
10/31/2012	0.67	0.76	5.9	6
11/30/2012	0.62	0.72	5.83	6.3
12/31/2012	0.58	0.65	5.1	4.08
01/31/2013	0.58	0.64	10.3	4.06
02/28/2013	0.58	0.64	6.25	6.18
03/31/2013	0.6	0.66	10.1	6.93
04/30/2013	0.59	0.61	10.93	6.36
05/31/2013	0.63	0.66	3.84	4.9
06/30/2013	0.71	0.8	2.75	3.37
07/31/2013	0.8	0.82	2.52	3.98
08/31/2013	0.82	0.86	2.26	3.39
09/30/2013	0.82	0.91	3.4	3.26
10/31/2013	0.73	0.79	2.94	4.69
11/30/2013	0.62	0.66	3.28	2.24
12/31/2013	0.62	0.65	3.45	3.44
01/31/2014	0.59	0.63	4.68	4.2
02/28/2014	0.61	0.77	5.25	4.41
03/31/2014	0.6	0.75	4.4	4.68
04/30/2014	0.61	0.65	2.92	2.27
05/31/2014	0.65	0.67	3	1.86
06/30/2014	0.71	0.84	2.53	3.44
07/31/2014	0.85	0.93	2.2	4.51
08/31/2014	0.82	0.88	1.85	3.06
Average	**0.642**	**0.740**	**4.985**	**4.627**
Median	**0.610**	**0.710**	**4.540**	**4.555**
90th Percentile	**0.800**	**0.880**	**8.965**	**6.240**
Summer Ave.	**0.768**	**0.872**	**4.230**	**4.260**
Population	4,348	Influent->	26.8	7.00
	148	202	83%	35%
	gpcd ave	gpcd max	removal	removal

Lewistown WWTP				MT0020044
	Effluent	Effluent	Effluent	Effluent
	Flow	Flow	TN	TP
	30DA AVG	DAILY MX	(mg/l)	(mg/l)
01/31/2010	1.25	1.44		0.8
02/28/2010	1.26	1.68		0.51
03/31/2010	1.48	1.85		0.76
04/30/2010	1.35	1.62		0.81
05/31/2010	2.38	3		0.88
06/30/2010	3.41	5.95		1.19
07/31/2010	2.58	3.32		0.47
08/31/2010	1.99	2.56		0.97
09/30/2010	1.83	2.16		0.94
10/31/2010	1.54	2		0.79
11/30/2010	1.48	2		0.49
12/31/2010	1.4	1.55		0.22
01/31/2011	1.34	1.55		0.26
02/28/2011	1.52	2.07		0.59
03/31/2011	1.87	2.44		1.62
04/30/2011	3.06	4.11		1.45
05/31/2011	5.41	10.5		0.34
06/30/2011	4.58	6.25		0.52
07/31/2011	2.55	3.03		0.37
08/31/2011	1.88	2.6		0.23
09/30/2011	1.45	1.66		0.54
10/31/2011	1.49	1.94		0.52
11/30/2011	1.32	1.47		0.36
12/31/2011	1.27	1.38		0.27
01/31/2012	1.26	1.46		0.19
02/29/2012	1.28	1.45		0.23
03/31/2012	1.49	1.73		0.82
04/30/2012	1.67	3.49		0.25
05/31/2012	1.48	1.73		0.68
06/30/2012	2.48	3.14		0.35
07/31/2012	2.19	2.7		0.37
08/31/2012	1.44	1.78		0.58
09/30/2012	1.31	1.8	3.15	0.55
10/31/2012	1.3	1.51	3.03	0.49
11/30/2012	1.48	1.77	1.55	0.5
12/31/2012	1.4	1.54	2.05	0.48
01/31/2013	1.36	1.55	1.65	0.55
02/28/2013	1.38	1.54	1.75	0.4
03/31/2013	1.49	1.91	1.6	0.84
04/30/2013	1.3	1.39	2.2	0.49
05/31/2013	1.69	3.16	3.87	0.45
06/30/2013	3.4	6.7	4.25	0.39
07/31/2013	2.26	2.7	3	0.37
08/31/2013	1.72	3.38	1.6	0.21
09/30/2013	1.51	1.94	6.45	0.52
10/31/2013	1.32	1.49	2.3	0.48
11/30/2013	1.21	1.41	1.85	0.29
12/31/2013	1.19	1.41	2.05	0.33
01/31/2014	1.24	1.4	2.5	0.2
02/28/2014	1.26	1.45	2.6	0.16
03/31/2014	2.22	2.94	2.75	0.39
04/30/2014	2.23	2.49	3.67	0.55
05/31/2014	2.07	2.6	3.15	0.8
06/30/2014	2.71	3.59	1.5	0.31
07/31/2014	2.35	2.91	2.95	0.52
08/31/2014	2.29	5.12	1.9	0.34
Average	**1.880**	**2.579**	**2.640**	**0.531**
Median	**1.490**	**1.940**	**2.400**	**0.490**
90th Percentile	**2.658**	**3.902**	**3.810**	**0.864**
Summer Ave.	**1.954**	**2.690**	**3.175**	**0.499**
Population	5,901	Influent->	12.4	3.39
	319	661	81%	86%
	gpcd ave	gpcd max	removal	removal

Conrad WWTP				MT0020079
	Effluent	Effluent	Effluent	Effluent
	Flow	Flow	TN	TP
	30DA AVG	DAILY MX	(mg/l)	(mg/l)
01/31/2010	0.81	1.08		
02/28/2010	0.53	1.08		
03/31/2010	0.83	1.08	~~74~~	~~9.54~~
04/30/2010	0.98	1.08		
05/31/2010	0.98	1.08		
06/30/2010	0.45	0.73	~~45.2~~	~~4.2~~
07/31/2010	0.31	0.55		
08/31/2010	0.28	0.3		
09/30/2010	0.2	0.4		
10/31/2010	0.22	0.45		
11/30/2010	0.18	0.29		
12/31/2010	0.16	0.24		
01/31/2011	0.18	0.28		
02/28/2011	0.2	0.29		
03/31/2011	0.16	0.26	~~49.2~~	~~5.8~~
04/30/2011	0.19	0.37		
05/31/2011	0.24	0.73		
06/30/2011	0.52	1.37	~~52.4~~	~~2.54~~
07/31/2011	0.19	0.26		
08/31/2011	0.17	0.19		
09/30/2011	0.15	0.19	~~62~~	~~5.98~~
10/31/2011	0.16	0.31		
11/30/2011	0.13	0.16		
12/31/2011	0.12	0.16	~~78.4~~	~~5.54~~
01/31/2012	0.12	0.15		
02/29/2012	0.12	0.12		
03/31/2012	0.12	1.62		
04/30/2012	0.15	0.21		
05/31/2012	0.18	0.34		
06/30/2012	0.23	0.3	~~17.2~~	~~5.8~~
07/31/2012	0.18	0.22		
08/31/2012	0.19	0.25		
09/30/2012	0.16	0.23	10	7.4
10/31/2012	0.16	0.25		
11/30/2012	0.16	0.22		
12/31/2012	0.14	0.17	8.8	4.4
01/31/2013	0.13	0.16		
02/28/2013	0.13	0.14		
03/31/2013	0.13	0.15	11.2	0.64
04/30/2013	0.14	0.16		
05/31/2013	0.17	0.34		
06/30/2013	0.22	0.25	10	2.92
07/31/2013	0.17	0.22		
08/31/2013	0.17	0.32		
09/30/2013	0.15	0.19	14	5.94
10/31/2013	0.13	0.15		
11/30/2013	0.13	0.22		
12/31/2013	0.13	0.14	22.6	1.56
01/31/2014	0.13	0.16		
02/28/2014	0.13	0.14		
03/31/2014	0.14	0.2	27.8	1.98
04/30/2014	0.16	0.44		
05/31/2014	0.16	0.21		
06/30/2014	0.23	0.25	9.2	0.52
07/31/2014	0.18	0.24		
08/31/2014	0.19	0.22		
Average	**0.228**	**0.368**	**14.200**	**3.170**
Median	**0.170**	**0.250**	**10.600**	**2.450**
90th Percentile	**0.394**	**0.940**	**24.160**	**6.378**
Summer Ave.	**0.192**	**0.270**	**12.000**	**6.670**
Population	2,570	Influent->	35.0	7.00
	89	366	70%	65%
	gpcd ave	gpcd max	removal	removal

Dillon WWTP				MT0021458
	Effluent	Effluent	Effluent	Effluent
	Flow	Flow	TN	TP
	30DA AVG	DAILY MX	(mg/l)	(mg/l)
01/31/2010	0.43	0	39	4.9
02/28/2010	0.4	0	37	4.4
03/31/2010	0.38	0.51	37	4.5
04/30/2010	0.43	1.35	36	5.4
05/31/2010	0.5	0.99	34	5.9
06/30/2010	0.37	0.91	30	5.1
07/31/2010	0.52	1.18	33.4	5.4
08/31/2010			29	4.1
09/30/2010			18	3.4
10/31/2010	0.5	0.56	19	3.5
11/30/2010	0.44	0.56	25	6
12/31/2010	0.34	0.38	31	4.7
01/31/2011	0.34	0.41	41	4.4
02/28/2011	0.36	0.38	37	4.3
03/31/2011	0.35	0.37	36	4.5
04/30/2011	0.33	0.36	31	4.6
05/31/2011	0.32	0.48	33	5
06/30/2011	0.37	0.56	35	5
07/31/2011	0.41	0.48	32	5.5
08/31/2011	0.51	0.62	27	4.5
09/30/2011	0.52	0.57	23.1	3.3
10/31/2011	0.47	0.53	21.8	3.1
11/30/2011	0.36	0.41	16	4.01
12/31/2011	0.31	0.36	28	3.7
01/31/2012	0.3	0.33	43	4.65
02/29/2012	0.31	0.33	41	4.6
03/31/2012	0.32	0.42	35	4.4
04/30/2012	0.31	0.36	36	4.8
05/31/2012	0.3	0.39	38	5.6
06/30/2012	0.33	0.38	40	6
07/31/2012	0.37	0.44	35	4.9
08/31/2012	0.39	0.45	26	4.5
09/30/2012	0.38	0.47	22	9.1
10/31/2012	0.38	0.44	24	3.9
11/30/2012	0.32	0.42	25	3.9
12/31/2012	0.27	0.31	31	4.6
01/31/2013	0.32	0.38	41	4.9
02/28/2013	0.32	0.35	34	4.8
03/31/2013	0.33	0.35	43	4.48
04/30/2013	0.33	0.36	38	5.5
05/31/2013	0.36	0.47	43	6.2
06/30/2013	0.38	0.64	42	6.4
07/31/2013	0.29	0.37	30	6.67
08/31/2013	0.28	0.31	14	4.88
09/30/2013	0.35	0.55	19	5.14
10/31/2013	0.31	0.37	29.8	4.8
11/30/2013	0.31	0.5	34	4.15
12/31/2013	0.24	0.33	31	4.32
01/31/2014	0.29	0.35	31.8	4.51
02/28/2014	0.35	0.53	37.9	4.71
03/31/2014	0.34	0.34	40.6	4.67
04/30/2014	0.34	0.5	40	5.03
05/31/2014	0.28	0.38	44	6.4
06/30/2014	0.38	0.82	47.9	7.63
07/31/2014	0.36	0.58	36.5	4.44
08/31/2014	0.38	0.54	10.3	2.93
Average	**0.361**	**0.476**	**32.377**	**4.870**
Median	**0.350**	**0.420**	**34.000**	**4.685**
90th Percentile	**0.461**	**0.634**	**41.500**	**6.100**
Summer Ave.	**0.397**	**0.547**	**25.379**	**4.911**
Population	4,134	Influent->	35.0	7.00
	87	153	3%	33%
	gpcd ave	gpcd max	removal	removal

Manhatton WWTP				MT0021857
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
	Ave	Max	(mg/l)	(mg/l)
01/31/2010				
02/28/2010				
03/31/2010			11	
04/30/2010				
05/31/2010				
06/30/2010			9.7	
07/31/2010				
08/31/2010				
09/30/2010	0.23	0.32		
10/31/2010	0.18	0.29		
11/30/2010	0.14	0.3		
12/31/2010	0.09	0.96	10.6	1.2
01/31/2011	0.09	0.39		
02/28/2011	0.09	0.62		
03/31/2011	0.09	0.3	11.6	1
04/30/2011	0.09	0.19		
05/31/2011	0.08	0.41		
06/30/2011	0.09	0.39	18.7	0.04
07/31/2011	0.09	0.19		
08/31/2011	0.11	0.26		
09/30/2011	0.16	0.28	11.9	0.72
10/31/2011	0.19	0.67		
11/30/2011	0.15	0.37		
12/31/2011	0.13	0.53	9.2	0.7
01/31/2012	0.09	0.95		
02/29/2012	0.09	0.2		
03/31/2012	0.09	0.59	11.1	3
04/30/2012	0.09	0.46		
05/31/2012	0.09	0.97		
06/30/2012	0.08	0.27	10.6	0.46
07/31/2012	0.12	0.37		
08/31/2012	0.18	0.32		
09/30/2012	0.27	0.47	6.7	0.06
10/31/2012	0.29	0.48		
11/30/2012	0.24	0.47		
12/31/2012	0.15	0.35	8	0.2
01/31/2013	0.1	0.28		
02/28/2013	0.09	0.97		
03/31/2013	0.12	0.33	16.6	0.11
04/30/2013	0.14	0.28		
05/31/2013	0.07	0.39		
06/30/2013	0.09	0.38	11.5	2.1
07/31/2013	0.14	0.5		
08/31/2013	0.15	0.55		
09/30/2013	0.22	0.54	7.2	0.55
10/31/2013	0.28	0.53		
11/30/2013	0.2	0.49		
12/31/2013	0.16	0.45	7.9	1.07
01/31/2014	0.09	0.36		
02/28/2014	0.08	0.78		
03/31/2014	0.1	0.55	9.5	1.7
04/30/2014	0.08	0.38		
05/31/2014	0.07	0.3		
06/30/2014	0.09	0.38	7.2	3.8
07/31/2014	0.09	0.38		
08/31/2014	0.18	0.29		
Average	**0.132**	**0.448**	**10.529**	**1.114**
Median	**0.100**	**0.385**	**10.600**	**0.720**
90th Percentile	**0.223**	**0.703**	**13.780**	**2.640**
Summer Ave.	**0.162**	**0.373**	**8.600**	**0.443**
Population	1,520	Influent->	35.0	7.00
	87	463	70%	90%
	gpcd ave	gpcd max	removal	removal

Kalispell WWTP				MT0021938
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	2.32	2.56	12.3	0.15
02/28/2010	2.46	2.87	9.83	0.15
03/31/2010	2.47	2.8	7.68	0.16
04/30/2010	2.55	3.03	10.46	0.11
05/31/2010	2.71	3.23	10.44	0.13
06/30/2010	3.51	6.03	10.35	0.09
07/31/2010	2.91	3.6	9.56	0.08
08/31/2010	2.6	2.89	7.32	0.14
09/30/2010	2.51	2.89	7.41	0.12
10/31/2010	2.32	2.66	7.45	0.11
11/30/2010	2.37	2.72	10.14	0.1
12/31/2010	2.56	3.66	10.34	0.17
01/31/2011	2.93	4.72	7.93	0.12
02/28/2011	2.79	3.62	9.3	0.16
03/31/2011	3.81	4.94	6.57	0.23
04/30/2011	3.63	4.45	7.26	0.12
05/31/2011	3.28	4.56	7.28	0.09
06/30/2011	4.19	5.13	6.86	0.1
07/31/2011	3.07	3.72	6.89	0.14
08/31/2011	2.62	2.87	8.88	0.12
09/30/2011	2.43	2.78	10.27	0.11
10/31/2011	2.36	3.15	9.6	0.11
11/30/2011	2.23	2.44	8.65	0.16
12/31/2011	2.23	2.46	9.12	0.11
01/31/2012	2.31	3.09	8.5	0.12
02/29/2012	2.4	3.07	7.24	0.13
03/31/2012	2.61	3.31	7.75	0.23
04/30/2012	2.65	2.87	8.37	0.22
05/31/2012	2.61	3.1	8.95	0.21
06/30/2012	3.52	4.87	8.19	0.2
07/31/2012	3.01	3.69	7.31	0.32
08/31/2012	2.22	2.53	8.18	0.21
09/30/2012	2.14	3.12	9.12	0.14
10/31/2012	2.23	3.11	9.52	0.08
11/30/2012	2.36	2.72	7.45	0.06
12/31/2012	2.39	2.57	8.08	0.08
01/31/2013	2.32	2.72	7.89	0.09
02/28/2013	2.39	2.53	5.83	0.07
03/31/2013	2.44	2.56	6.17	0.07
04/30/2013	2.63	3.03	6.4	0.1
05/31/2013	2.84	4.45	5.74	0.09
06/30/2013	2.86	3.46	6.17	0.09
07/31/2013	2.58	2.84	6.49	0.09
08/31/2013	2.53	3.05	7.63	0.23
09/30/2013	2.57	3.78		0.11
10/31/2013	2.3	2.52	7.25	0.08
11/30/2013	2.33	3.11	5.35	0.07
12/31/2013	2.34	2.62	7.79	0.09
01/31/2014	2.4	2.95	6.59	0.09
02/28/2014	2.59	3.62	8.19	0.09
03/31/2014	3.72	5.85	15.33	0.09
04/30/2014	2.87	3.11	5.85	0.06
05/31/2014	2.95	3.23	5.31	0.07
06/30/2014	3.84	8.36	5.89	0.08
07/31/2014	3	3.58	6.24	0.09
08/31/2014	2.63	2.87	7.08	0.09
Average	**2.704**	**3.430**	**8.068**	**0.124**
Median	**2.575**	**3.095**	**7.750**	**0.110**
90th Percentile	**3.515**	**4.795**	**10.312**	**0.210**
Summer Ave.	**2.630**	**3.158**	**7.875**	**0.142**
Population	19,927	Influent->	29.2	7.00
	136	241	73%	98%
	gpcd ave	gpcd max	removal	removal

Butte WWTP				MT0022012
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	2.53	2.71	20	1.74
02/28/2010	2.53	2.64	24	1.66
03/31/2010	2.51	2.73	18	1.63
04/30/2010	3.34	3.98	18	1.51
05/31/2010	3.76	4.83	20	2.24
06/30/2010	4.28	6.23	15.3	1.53
07/31/2010	4.05	4.63	17.3	2.2
08/31/2010	3.94	4.42	17.5	1.39
09/30/2010	4.03	4.76	15.8	1.45
10/31/2010	4.15	4.41	14.2	1.37
11/30/2010	4.01	4.47	19	1.35
12/31/2010	3.82	4.14	19	1.1
01/31/2011	3.76	4.24	20	1.13
02/28/2011	3.73	4.34	20	1.44
03/31/2011	3.91	4.18	18	1.3
04/30/2011	3.95	4.11	20.1	2.08
05/31/2011	4.18	4.92	18.5	2.11
06/30/2011	5	6.59	15.3	1.31
07/31/2011	3.89	4.65	21.1	1.93
08/31/2011	3.75	4.79	17.3	1.32
09/30/2011	3.87	4.18	17.2	2
10/31/2011	3.83	4.09	14	1.54
11/30/2011	3.73	3.92	21.4	1.52
12/31/2011	3.68	3.91	16.2	1.32
01/31/2012	3.71	3.85	17	1.29
02/29/2012	3.69	3.84	18	1.25
03/31/2012	3.87	4.33	20	1.7
04/30/2012	4	4.24		
05/31/2012	3.84	4.04		
06/30/2012	3.59	3.97		1.92
07/31/2012	3.9	4.77		1.81
08/31/2012	3.58	3.96		1.44
09/30/2012	3.75	3.94		1.96
10/31/2012	3.84	4.06		
11/30/2012	3.8	4.16		
12/31/2012	3.76	3.95		
01/31/2013	3.7	3.87		
02/28/2013	3.75	3.87		
03/31/2013	3.82	3.95		
04/30/2013	3.73	3.9		
05/31/2013	3.74	4.21		
06/30/2013	3.62	4.81		2.2
07/31/2013	3.65	4.12		2.29
08/31/2013	3.68	4.31		1.79
09/30/2013	4.11	4.79		1.89
10/31/2013	4.04	4.26		
11/30/2013	3.82	4.08		
12/31/2013	3.75	4.11		
01/31/2014	3.58	3.81		
02/28/2014	3.68	3.9		
03/31/2014	4.07	5.22		
04/30/2014	4.05	4.67		
05/31/2014	4.11	4.44		
06/30/2014	3.94	4.83		2.19
07/31/2014	3.63	4.5		1.72
08/31/2014	3.87	5.09		1.35
Average	**3.784**	**4.281**	**18.230**	**1.657**
Median	**3.810**	**4.180**	**18.000**	**1.585**
90th Percentile	**4.090**	**4.830**	**20.500**	**2.193**
Summer Ave.	**3.836**	**4.494**	**17.700**	**1.753**
Population	33,525	Influent->	35.0	7.00
	113	144	49%	77%
	gpcd ave	gpcd max	removal	removal

East Helena WWTP				MT0022560
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.27	0.27	0	
02/28/2010	0.16	0.16	16.17	
03/31/2010	0.14	0.14	24.45	
04/30/2010	0.18	0.24	21.46	
05/31/2010	0.25	0.34	11.52	
06/30/2010	0.76	1.06	4.03	
07/31/2010	0.6	1.76	7.6	
08/31/2010	0.45	0.76	9.21	1.24
09/30/2010	0.38	0.57	11.9	1.59
10/31/2010	0.29	0.36	12.6	2.4
11/30/2010	0.24	0.41	19.86	2.76
12/31/2010	0.3	0.54	19.1	3.06
01/31/2011	0.34	0.54	14.4	1.48
02/28/2011	0.26	0.37	21.5	3.62
03/31/2011	0.23	0.32	20.12	3.66
04/30/2011	0.21	0.57	26.45	3.99
05/31/2011	0.49	0.95	20.78	4.34
06/30/2011	1.42	2.9	5.6	1.71
07/31/2011	0.92	1.37	6.22	0.72
08/31/2011	0.6	0.83	7.66	0.86
09/30/2011	0.48	0.71	9.8	1.23
10/31/2011	0.48	0.64	7.9	1.59
11/30/2011	0.38	0.48	12.38	0.3
12/31/2011	0.35	0.68	12.13	2.29
01/31/2012	0.35	0.61	18.3	2.44
02/29/2012	0.26	0.32	16.72	4.14
03/31/2012	0.24	0.3	14.13	2.82
04/30/2012	0.26	0.4	16.4	2.05
05/31/2012	0.46	0.6	11.08	1.75
06/30/2012	0.38	0.49	11.22	1.66
07/31/2012	0.38	0.51	12.2	2.38
08/31/2012	0.33	0.67	11.86	2.41
09/30/2012	0.24	0.42	12.05	2.36
10/31/2012	0.27	0.52	18.48	3.03
11/30/2012	0.28	0.48	15.58	2.95
12/31/2012	0.33	0.54	18.47	2.95
01/31/2013	0.48	0.65	13.02	1.77
02/28/2013	0.21	0.27	23.9	3.54
03/31/2013	0.23	0.44	26.35	0.37
04/30/2013	0.22	0.28	25.3	3.87
05/31/2013	0.35	0.53	16.57	3.49
06/30/2013	0.47	0.64	11.65	1.66
07/31/2013	0.35	0.57	12.92	2.07
08/31/2013	0.22	0.4	17.57	2.82
09/30/2013	0.26	0.3	20.72	3.29
10/31/2013	0.18	0.22	31.8	3.29
11/30/2013	0.18	0.41	22.1	6.13
12/31/2013	0.29	0.6	12.86	5.28
01/31/2014	0.15	0.23	15.68	4.87
02/28/2014	0.19	0.33	9.67	5.29
03/31/2014	0.27	0.73	15.35	6.35
04/30/2014	0.3	0.4	16.96	0.26
05/31/2014	0.53	0.78	9.1	0.28
06/30/2014	0.66	0.73	8.92	0.09
07/31/2014	0.64	0.78	10.28	0.32
08/31/2014	0.57	0.71	7.97	0.59
Average	**0.370**	**0.586**	**14.786**	**2.519**
Median	**0.300**	**0.525**	**13.575**	**2.400**
90th Percentile	**0.600**	**0.805**	**23.000**	**4.446**
Summer Ave.	**0.459**	**0.740**	**11.283**	**1.683**
Population	1,984	Influent->	21.2	5.79
	186	406	36%	59%
	gpcd ave	gpcd max	removal	removal

Missoula WWTP				MT0022594
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
	Ave	Max	(mg/l)	(mg/l)
01/31/2010	9.31	10.08	11.91	0.37
02/28/2010	9.86	10.39	10.82	1.6
03/31/2010	9.94	10.67	12.48	0.5
04/30/2010	10.16	10.4	9.57	0.27
05/31/2010	9.67	10.39	9.25	0.25
06/30/2010	9.77	9.97	8.21	0.24
07/31/2010	8.1	8.59	7.43	0.16
08/31/2010	8.18	8.33	8.97	0.18
09/30/2010	8.9	8.97	9.58	0.41
10/31/2010	9.55	10.5	10	0.19
11/30/2010	6.6	9.9	9.88	0.23
12/31/2010	6.18	7.34	10.55	0.27
01/31/2011	6.5	9.37	9.99	0.28
02/28/2011	6.6	8.49	10.31	0.27
03/31/2011	6.98	7.43	10.46	0.27
04/30/2011	6.89	7.57	9.94	0.25
05/31/2011	7.62	8.91	9.33	0.24
06/30/2011	10.33	11.54	6.66	0.18
07/31/2011	8.03	8.78	7.18	0.17
08/31/2011	6.71	6.99	8.94	0.19
09/30/2011	6.82	6.91	10.16	0.17
10/31/2011	6.91	7.1	11.22	0.31
11/30/2011	6.42	6.94	10.28	0.32
12/31/2011	6.2	7.18	9.34	0.46
01/31/2012	6.38	7.44	13.08	0.64
02/29/2012	6.6	7.91	9.94	0.47
03/31/2012	7.03	7.72	9.23	0.35
04/30/2012	6.86	8.39	9.04	0.24
05/31/2012	7.03	7.96	8.54	0.22
06/30/2012	6.91	7.15	7.9	0.21
07/31/2012	6.26	6.81	7.75	0.23
08/31/2012	6.24	6.86	8.15	0.7
09/30/2012	6.5	7.54	9.73	0.43
10/31/2012	6.54	7.04	10.8	0.49
11/30/2012	6.48	7.41	10.7	0.46
12/31/2012	6.07	7.23	9.87	0.25
01/31/2013	6.02	6.98	9.79	0.54
02/28/2013	0	0	8.93	0.45
03/31/2013	6.82	7.19	8.93	0.45
04/30/2013	6.77	7.35	8.8	0.26
05/31/2013	6.88	7.72	8.51	0.26
06/30/2013	6.46	7.3	8.06	0.9
07/31/2013	6.28	6.93	7.62	0.36
08/31/2013	6.36	7.18	9.01	0.6
09/30/2013	6.69	7.6	11.52	1.07
10/31/2013	6.51	7.17	9.74	1.13
11/30/2013	6.43	7.04	9.39	0.43
12/31/2013	6.08	7.04	10.9	1.28
01/31/2014	6.13	7.01	9.73	0.85
02/28/2014	6.58	8.29	9.84	0.72
03/31/2014	7.67	11.28	9.49	2.41
04/30/2014	6.69	7.15	7.96	0.38
05/31/2014	7.51	9.69	6.98	0.3
06/30/2014	8.02	9.34	7.23	0.39
07/31/2014	6.57	7.66	7.89	0.4
08/31/2014	6.11	7.06	7.41	0.61
Average	**7.062**	**7.984**	**9.327**	**0.471**
Median	**6.700**	**7.555**	**9.440**	**0.355**
90th Percentile	**9.622**	**10.390**	**10.812**	**0.880**
Summer Ave.	**6.982**	**7.586**	**8.667**	**0.406**
Population	66,788	Influent->	35.0	7.00
	106	156	73%	95%
	gpcd ave	gpcd max	removal	removal

Bozeman WWTP				MT0022608
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	4.62	5.07	~~9.9~~	~~2.66~~
02/28/2010	4.66	4.88	~~10.1~~	~~2.89~~
03/31/2010	5.25	6.04	~~9.9~~	~~2.37~~
04/30/2010	5.88	6.45	~~9.2~~	~~2.27~~
05/31/2010	5.61	6.65	~~8.59~~	~~2.11~~
06/30/2010	7.22	8.83	~~10.3~~	~~1.61~~
07/31/2010	5.57	6.76	~~8.9~~	~~1.96~~
08/31/2010	5.26	6.05	~~10.2~~	~~2.17~~
09/30/2010	5.63	6.72	~~14.3~~	~~2.59~~
10/31/2010	5.2	5.56	~~10.43~~	~~2.62~~
11/30/2010	4.93	5.53	~~10.26~~	~~2.49~~
12/31/2010	4.55	5.01	~~9.53~~	~~2.63~~
01/31/2011	4.56	5.73	~~9.77~~	~~2.39~~
02/28/2011	4.53	4.96	~~11.54~~	~~2.57~~
03/31/2011	5	6.08	~~18.87~~	~~2.33~~
04/30/2011	6.47	7.48	~~12.61~~	~~1.74~~
05/31/2011	7.26	8.95	~~10.94~~	~~1.44~~
06/30/2011	7.9	9.71	~~9~~	~~1.46~~
07/31/2011	5.9	7.15	~~9~~	~~2.12~~
08/31/2011	5.09	5.63	~~9.5~~	~~2.85~~
09/30/2011	5.16	6.3	~~6~~	~~1.02~~
10/31/2011	5.05	6.06	~~7.22~~	~~0.17~~
11/30/2011	4.87	5.18	~~3.3~~	~~0.17~~
12/31/2011	4.58	5.02	~~5.83~~	~~0.32~~
01/31/2012	4.62	4.97	5.66	0.77
02/29/2012	4.8	4.3	4.51	0.4
03/31/2012	4.97	6.35	6.65	2.55
04/30/2012	5.48	6.7	5.92	1.32
05/31/2012	5.44	6.15	4	1.17
06/30/2012	5.6	6.18	2.85	0.54
07/31/2012	5.36	5.75	3.27	0.58
08/31/2012	5.31	5.74	3.52	0.13
09/30/2012	5.24	6.19	4.34	0.17
10/31/2012	5.16	6.7	5.42	0.18
11/30/2012	5.15	5.63	5.19	0.77
12/31/2012	5	5.8	4.09	0.32
01/31/2013	5.27	5.73	5.11	0.3
02/28/2013	5.53	6.01	5.12	0.98
03/31/2013	5.63	6.12	4.5	0.14
04/30/2013	5.91	6.37	5.14	0.19
05/31/2013	6.37	7	4.1	0.15
06/30/2013	6.27	7.3	2.79	0.12
07/31/2013	5.55	9.91	2.82	0.09
08/31/2013	5.18	5.67	3.1	0.1
09/30/2013	5.55	7.06	3.47	0.12
10/31/2013	5.66	6.49	4	0.1
11/30/2013	5.4	6.29	4.33	0.16
12/31/2013	5.08	5.88	3.71	0.17
01/31/2014	5.24	5.94	5.64	0.17
02/28/2014	5.25	5.89	4.5	0.14
03/31/2014	6.33	8.3	4	0.32
04/30/2014	7.45	8.49	4	0.36
05/31/2014	7.22	8.7	4.6	0.32
06/30/2014	6.72	7.35	4	0.21
07/31/2014	6.17	7.11	3.1	0.13
08/31/2014	5.93	7.5	3.2	0.1
Average	**5.546**	**6.453**	**6.640**	**1.075**
Median	**5.335**	**6.165**	**5.305**	**0.560**
90th Percentile	**6.595**	**8.395**	**10.365**	**2.580**
Summer Ave.	**5.493**	**6.681**	**6.051**	**1.009**
Population	37,280	Influent->	26.6	7.00
	149	225	80%	92%
	gpcd ave	gpcd max	removal	removal

Deer Lodge WWTP				MT0022616
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.57	0.69	10.2	1.41
02/28/2010	0.6	0.64	10.8	1.52
03/31/2010	0.68	0.78	11.3	1.6
04/30/2010	0.88	0.99	8.52	1.24
05/31/2010	1.09	1.2	0.37	0.71
06/30/2010	2.4	2.9	6.43	0.93
07/31/2010	2	2.72	5.84	0.76
08/31/2010	0.36	0.57	5.37	0.9
09/30/2010	1.25	1.38	6.75	1.12
10/31/2010	0.98	1.15	7.68	1.24
11/30/2010	0.85	0.99	7.52	0.42
12/31/2010	0.73	0.87	6.18	6.92
01/31/2011	0.8	0.8	6.02	1.17
02/28/2011	0.66	0.74	8.59	1.45
03/31/2011	0.7	0.83	8.35	1.58
04/30/2011	0.82	0.87	8.06	1
05/31/2011	1.21	1.86	5.3	0.71
06/30/2011	3.34	4.5	4.43	0.66
07/31/2011	2.36	2.95	4.57	0.86
08/31/2011	2	2.49	4.78	0.69
09/30/2011	1.51	1.69	6.55	1.14
10/31/2011	1.57	1.97	7.07	0.43
11/30/2011	1.1	1.29	4	0.53
12/31/2011	0.99	1.07	6.34	0.96
01/31/2012	1.03	1.09	6.91	0.8
02/29/2012	0.88	0.99	6.26	0.83
03/31/2012	1.04	1.29	6	0.87
04/30/2012	1.45	1.71	3.72	0.7
05/31/2012	2.09	2.81	4.91	0.78
06/30/2012	2.6	2.95	4.93	0.85
07/31/2012	2.28	2.86	3.44	0.45
08/31/2012	1.58	1.78	5.45	1.22
09/30/2012	1.37	1.62	6.44	0.94
10/31/2012	1.25	1.62	6	0.86
11/30/2012	1.02	1.09	4.05	0.58
12/31/2012	1	1.07	4.71	0.79
01/31/2013	0.85	0.87	7.46	0.83
02/28/2013	0.86	0.87	4.31	0.85
03/31/2013	0.9	0.97	5.26	0.94
04/30/2013	0.91	0.99	4.86	0.82
05/31/2013	1.9	2.77	7.28	0.81
06/30/2013	2.47	2.81	5.44	0.63
07/31/2013	1.79	2.49	4.24	0.59
08/31/2013	1.2	1.41	5.43	1.47
09/30/2013	1.11	1.23	6.35	0.97
10/31/2013	1.1	1.23	5.52	0.72
11/30/2013	0.85	0.92	4.21	0.74
12/31/2013	0.81	0.85	7.68	0.97
01/31/2014	0.81	0.85	17.3	0.95
02/28/2014	0.79	0.83	7.56	1
03/31/2014	1.29	1.74	6.52	0.76
04/30/2014	1.09	1.29	2.71	0.52
05/31/2014	1.28	2.05	1.81	0.6
06/30/2014	1.71	2.05	2.93	0.52
07/31/2014	1.28	1.68	4.14	0.97
08/31/2014	0.96	1.26	7.03	0.78
Average	**1.268**	**1.535**	**6.105**	**1.001**
Median	**1.090**	**1.245**	**6.000**	**0.850**
90th Percentile	**2.185**	**2.810**	**8.435**	**1.430**
Summer Ave.	**1.504**	**1.866**	**5.456**	**0.919**
Population	3,111	Influent->	9.7	2.65
	408	903	38%	68%
	gpcd ave	gpcd max	removal	removal

0010933

Helena WWTP				MT0022641
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	2.9	4.67	12.1	0.84
02/28/2010	2.75	3.84	6.9	0.88
03/31/2010	2.7	5.26	8.64	0.86
04/30/2010	2.6	3.01	7.97	3.98
05/31/2010	2.63	3.48	5.16	1.41
06/30/2010	2.97	4.18	5.27	0.99
07/31/2010	2.67	3.04	5.9	1.06
08/31/2010	2.77	3.34	6.23	1.75
09/30/2010	2.73	3.2	10.03	3.61
10/31/2010	2.65	2.88	10.59	2.48
11/30/2010	2.89	4.12	6.22	3.07
12/31/2010	2.72	3.79	9.4	3.74
01/31/2011	2.79	3.42	7.11	1.16
02/28/2011	2.99	3.8	7.55	2.2
03/31/2011	2.86	4.26	8.13	2.37
04/30/2011	2.78	2.94	5.46	2.28
05/31/2011	2.89	3.48	6.54	2.1
06/30/2011	3.66	5.33	7.02	2.31
07/31/2011	3.12	3.74	4.67	2.07
08/31/2011	2.95	3.43	5.47	2.14
09/30/2011	2.91	3.24	5.95	3.16
10/31/2011	2.95	3.11	6.15	2.15
11/30/2011	2.91	3.18	6.11	2.39
12/31/2011	2.91	3.52	6.21	2.78
01/31/2012	3.07	4.79	5.57	0.98
02/29/2012	3.08	3.82	8.79	2.09
03/31/2012	3.26	3.55	6.13	2.63
04/30/2012	3.12	3.35	5.8	2.64
05/31/2012	3	3.48	5.35	1.68
06/30/2012	2.86	3.21	7.21	1.24
07/31/2012	2.74	3	6.73	3.68
08/31/2012	2.68	2.99	10.88	3.15
09/30/2012	2.77	3.76	7.13	4.14
10/31/2012	3.41	3.54	6.35	2.55
11/30/2012	3.55	3.84	6.54	2.94
12/31/2012	3.68	3.74	7.07	2.85
01/31/2013	3.5	3.75	7.65	2.96
02/28/2013	3.51	4.08	7.48	3.08
03/31/2013	3.17	3.65	7.04	2.42
04/30/2013	3.05	3.44	6.7	2.38
05/31/2013	3.16	3.58	6.64	2.82
06/30/2013	3.13	3.57	0	2.89
07/31/2013	2.93	3.47	0	2.62
08/31/2013	3.35	3.99	9.3	2.82
09/30/2013	3.05	3.58	6.46	3.58
10/31/2013	2.96	3.38	5.91	2.86
11/30/2013	2.72	3.25	4.92	2.34
12/31/2013	3.16	3.42	4.88	2.37
01/31/2014	3.33	3.25	5.43	2.23
02/28/2014	3.73	3.52	7.81	1.78
03/31/2014	4.23	4.76	3.69	2.32
04/30/2014	3.38	3.91	5.89	2.8
05/31/2014	3.04	3.63	5.51	2.62
06/30/2014	3.31	3.92	6.17	3.01
07/31/2014	2.98	3.68	5.1	2.13
08/31/2014	3.76	4.57	5.24	1.75
Average	**3.060**	**3.674**	**6.538**	**2.395**
Median	**2.975**	**3.560**	**6.290**	**2.385**
90th Percentile	**3.530**	**4.415**	**9.045**	**3.370**
Summer Ave.	**2.958**	**3.502**	**6.364**	**2.690**
Population	28,190	Influent->	35.0	7.00
	109	157	82%	66%
	gpcd ave	gpcd max	removal	removal

Rocker WWTP				MT0027430
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.02	0.03	25.9	
02/28/2010	0.02	0.03	23.9	
03/31/2010	0.03	0.03	14.8	
04/30/2010	0.02	0.03	21	
05/31/2010	0.03	0.04	20.7	
06/30/2010	0.03	0.05	19.2	
07/31/2010	0.03	0.04	17.6	
08/31/2010	0.03	0.04	16.2	
09/30/2010	0.02	0.03	14.7	
10/31/2010	0.02	0.03	19.9	
11/30/2010	0.02	0.03	24.8	
12/31/2010	0.02	0.02	29.7	
01/31/2011	0.02	0.02	25	
02/28/2011	0.02	0.02	22.6	
03/31/2011	0.02	0.03	21.5	
04/30/2011	0.02	0.04	30.7	
05/31/2011	0.02	0.04	21.1	
06/30/2011	0.02	0.04	18.9	
07/31/2011	0.03	0.03	22.3	
08/31/2011	0.03	0.04	16.9	
09/30/2011	0.02	0.03	18.5	
10/31/2011	0.02	0.03	10.4	
11/30/2011	0.02	0.02	20.4	
12/31/2011	0.02	0.02	30.8	
01/31/2012	0.02	0.03	24	
02/29/2012	0.02	0.02	17.5	
03/31/2012	0.02	0.03	22.2	
04/30/2012	0.02	0.03	17.6	
05/31/2012	0.02	0.02	17.4	
06/30/2012	0.02	0.02	10.9	
07/31/2012	0.02	0.04	10.9	
08/31/2012	0.02	0.03	6.32	
09/30/2012	0.02	0.02	7.96	
10/31/2012	0.02	0.03	11.6	
11/30/2012	0.02	0.03	15.9	
12/31/2012	0.02	0.02	21.3	
01/31/2013	0.02	0.02	22.7	
02/28/2013	0.02	0.02	20.5	
03/31/2013	0.02	0.02	22.1	
04/30/2013	0.02	0.07	15.5	
05/31/2013	0.02	0.05	16.8	
06/30/2013	0.02	0.05	11	7.33
07/31/2013	0.03	0.06	13.8	11.8
08/31/2013	0.03	0.04	8.53	9.82
09/30/2013	0.03	0.06	12.1	7.94
10/31/2013	0.03	0.03		
11/30/2013	0.02	0.03		
12/31/2013	0.02	0.03		
01/31/2014	0.02	0.03		
02/28/2014	0.02	0.03		
03/31/2014	0.02	0.04		
04/30/2014	0.02	0.04		
05/31/2014	0.02	0.03		
06/30/2014	0.02	0.04	11	11
07/31/2014	0.02	0.04	10.9	13.8
08/31/2014	0.03	0.07	11.8	13.8
Average	**0.022**	**0.034**	**18.079**	**10.784**
Median	**0.020**	**0.030**	**18.050**	**11.000**
90th Percentile	**0.030**	**0.050**	**24.860**	**13.800**
Summer Ave.	**0.026**	**0.041**	**13.465**	**11.432**
Population	100	Influent->	17.9	4.87
	221	500	-1%	-126%
	gpcd ave	gpcd max	removal	removal

Absarokee WWTP				MT0020052
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.107			
02/28/2010	0.086			
03/31/2010	0.099		27.03	4.11
04/30/2010	0.101			
05/31/2010	0.173			
06/30/2010	0.655		20.48	3.4
07/31/2010	0.632			
08/31/2010	0.393			
09/30/2010	0.340		2.22	0.53
10/31/2010	0.190			
11/30/2010	0.075			
12/31/2010	0.043		15.61	2.08
01/31/2011	0.048			
02/28/2011	0.049			
03/31/2011	0.046		25.98	3.59
04/30/2011	0.066			
05/31/2011	0.461			
06/30/2011	0.580		5.22	0.44
07/31/2011	0.746			
08/31/2011	0.585			
09/30/2011	0.377		3.2	0.4
10/31/2011	0.190			
11/30/2011	0.084			
12/31/2011	0.050		19.15	2.17
01/31/2012	0.040			
02/29/2012	0.040			
03/31/2012	0.040		32.04	3.7
04/30/2012	0.040			
05/31/2012	0.435			
06/30/2012	0.730		2.98	0.42
07/31/2012	0.674			
08/31/2012	0.418			
09/30/2012	0.298		5.94	0.89
10/31/2012	0.233			
11/30/2012	0.091			
12/31/2012	0.042		19.4	2.3
01/31/2013	0.037			
02/28/2013	0.036			
03/31/2013	0.037		37.94	3.82
04/30/2013	0.037			
05/31/2013	0.245			
06/30/2013	0.582		6.05	0.56
07/31/2013	0.455			
08/31/2013	0.446			
09/30/2013	0.288		5.2	0.7
10/31/2013	0.248			
11/30/2013	0.081			
12/31/2013	0.076		22.25	2.52
01/31/2014	0.040			
02/28/2014	0.043			
03/31/2014	0.192		10.72	1.04
04/30/2014	0.374			
05/31/2014	0.320			
06/30/2014	0.468		5.5	0.62
07/31/2014	0.562			
08/31/2014	0.491			
Average	**0.256**		**14.828**	**1.849**
Median	**0.190**		**13.165**	**1.560**
90th Percentile	**0.583**		**28.533**	**3.736**
Summer Ave.	**0.479**		**4.140**	**0.630**
Population	1,684	Influent->	26.1	7.00
	152		49%	78%
	gpcd ave	gpcd max	removal	removal

Red Lodge WWTP				MT0020478
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.59	0.76	13	1.95
02/28/2010	0.55	0.75	14.1	2.1
03/31/2010	0.58	0.68	15.8	2.28
04/30/2010	0.55	0.71	13	2.39
05/31/2010	0.81	1.2	7.1	2.3
06/30/2010	0.86	1	9.6	2
07/31/2010	0.76	1	15.5	2.56
08/31/2010	0.76	1.1	15.8	2.33
09/30/2010	0.61	0.8	10.8	1.74
10/31/2010	0.52	0.91	12.87	2.34
11/30/2010	0.53	0.76	15.6	2.18
12/31/2010	0.54	0.68	14.48	2.12
01/31/2011	0.49	0.65	15	2.36
02/28/2011	0.44	0.58	15	2.36
03/31/2011	0.49	0.74	16	2.23
04/30/2011	0.54	0.75	12.75	1.96
05/31/2011	1.39	3.4	11.25	1.82
06/30/2011	1.15	3.1	4.78	0.71
07/31/2011	1.1	1.9	8.75	1.4
08/31/2011	0.63	0.77	11.18	1.63
09/30/2011	0.52	0.65	10.32	1.52
10/31/2011	0.45	0.67	13.32	2.04
11/30/2011	0.48	0.62	14.88	2.22
12/31/2011	0.45	0.59	16.22	2.32
01/31/2012	0.42	0.59	16.52	2.22
02/29/2012	0.36	0.42	18.6	2.4
03/31/2012	0.44	0.69	17.4	2.28
04/30/2012	0.4	0.58	16.25	2.16
05/31/2012	0.4	0.79	11.96	2.49
06/30/2012	0.49	0.61	16	2.48
07/31/2012	0.55	0.68	19.25	3.07
08/31/2012	0.55	0.68	19	2.88
09/30/2012	0.55	0.63	19	2.58
10/31/2012	0.49	0.65	18.2	2.55
11/30/2012	0.47	0.54	19	2.45
12/31/2012	0.44	0.55	19.25	2.52
01/31/2013	0.36	0.55	18.8	2.6
02/28/2013	0.26	0.42	19	2.56
03/31/2013	0.26	0.39	19.4	2.38
04/30/2013	0.3	0.43	17.6	2.24
05/31/2013	0.52	1.45	15.4	2.25
06/30/2013	0.73	1.18	15.78	2.21
07/31/2013	0.77	1.98	14.76	2.02
08/31/2013	0.58	0.73	17.37	2.52
09/30/2013	0.66	1.18	17.42	2.72
10/31/2013	0.88	1.06	14.58	2.02
11/30/2013	0.61	0.79	11.75	1.69
12/31/2013	0.56	0.78	11.72	1.7
01/31/2014	0.46	0.69	12.96	1.82
02/28/2014	0.45	0.62	14.9	2.1
03/31/2014	0.54	0.91	15.2	2.14
04/30/2014	0.95	1.4	12.18	1.65
05/31/2014	0.8	1.19	7.62	1.22
06/30/2014	0.79	1.2	10.02	1.75
07/31/2014	0.75	0.93	13.18	2.22
08/31/2014	0.61	0.78	13.6	2.07
Average	**0.593**	**0.908**	**14.478**	**2.158**
Median	**0.545**	**0.745**	**14.950**	**2.220**
90th Percentile	**0.835**	**1.300**	**19.000**	**2.560**
Summer Ave.	**0.671**	**0.986**	**14.709**	**2.233**
Population	2,125	Influent->	14.2	3.87
	279	612	-5%	43%
	gpcd ave	gpcd max	removal	removal

Laurel WWTP				MT0020311
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.64	0.71	28.3	4.4
02/28/2010	0.66	0.76	26.6	4.56
03/31/2010	0.69	0.81	22.9	4.2
04/30/2010	0.83	1.04	25.6	3.57
05/31/2010	0.94	1.4	21.1	4.5
06/30/2010	1.11	1.31	10.2	2.4
07/31/2010	1.19	1.35	11.3	2.43
08/31/2010	1.22	1.93	9.2	1.6
09/30/2010	1.25	1.52	11.8	2.8
10/31/2010	0.95	1.07	14.2	3.5
11/30/2010	0.8	0.9	13.4	3.2
12/31/2010	0.74	0.84	16.6	3.4
01/31/2011	0.74	0.89	21.3	3.6
02/28/2011	0.71	0.79	22.5	3.4
03/31/2011	0.73	0.84	26.4	3.97
04/30/2011	0.92	1.17	21.5	3.2
05/31/2011	1.7	3.44	13.4	1.44
06/30/2011	1.42	1.8	11.4	1.9
07/31/2011	1.42	1.76	9.45	2
08/31/2011	1.39	1.58	8.5	1.84
09/30/2011	1.15	1.6	10.7	2.3
10/31/2011	1.02	1.37	12.6	2.6
11/30/2011	0.85	0.94	14.4	2.6
12/31/2011	0.79	0.82	16.2	2.9
01/31/2012	0.74	0.8	23.6	3.1
02/29/2012	0.68	0.73	24.2	3.6
03/31/2012	0.67	0.75	26.3	4
04/30/2012	0.76	0.97	21.9	3.7
05/31/2012	0.91	1.43	16	3.5
06/30/2012	1.09	1.32	10.7	2.6
07/31/2012	1.16	1.34	9.1	2.1
08/31/2012	1.11	1.39	12	2.56
09/30/2012	0.95	1.18	11.2	2.8
10/31/2012	0.94		14	2.4
11/30/2012	0.78	0.89	18	3.2
12/31/2012	0.69	0.79	20	3.2
01/31/2013	0.65	0.75	22	3.4
02/28/2013	0.64	0.71	24	3.8
03/31/2013	0.63	0.72	21.5	3.95
04/30/2013	0.72	0.81	23.6	3.67
05/31/2013	0.97	2.25	17.95	3.4
06/30/2013	1.19	1.42	11.3	
07/31/2013	1.13	1.23	10.85	2.65
08/31/2013	1.01	1.21	10.15	2.6
09/30/2013	1.07	1.46	11.05	2.5
10/31/2013			10.25	1.93
11/30/2013	0.87	0.99	13.25	2.42
12/31/2013	0.79	0.93	17.85	2.72
01/31/2014	0.82	0.89	26	2.78
02/28/2014	0.8	0.95	23.95	3.17
03/31/2014	0.97	1.23	18.4	2.42
04/30/2014	0.86	1.11	21.95	2.82
05/31/2014	0.88	1.18	17.15	2.58
06/30/2014	0.88	1.13	15.65	2.84
07/31/2014	1.1	1.44	13	2.68
08/31/2014	1.08	1.57	10.65	2.09
Average	**0.935**	**1.189**	**16.912**	**2.973**
Median	**0.880**	**1.120**	**16.100**	**2.820**
90th Percentile	**1.208**	**1.594**	**24.900**	**3.962**
Summer Ave.	**1.159**	**1.469**	**10.639**	**2.354**
Population	6,718	Influent->	28.4	7.00
	139	237	43%	60%
	gpcd ave	gpcd max	removal	removal

0010938

Western Sugar				MT0000281
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	1.495		31.63	0.86
02/28/2010	0		0	0
03/31/2010	0		0	0
04/30/2010	0		0	0
05/31/2010	0		0	0
06/30/2010	0		0	0
07/31/2010	0		0	0
08/31/2010	0		0	0
09/30/2010	2.895		34.56	0.55
10/31/2010	3.505		33.64	0.552
11/30/2010	2.615		44.89	1.1
12/31/2010	3.165		43.21	0.46
01/31/2011	2.83		42.73	0.45
02/28/2011	1.4		35.11	0.315
03/31/2011	0		0	0
04/30/2011	0		0	0
05/31/2011	0		0	0
06/30/2011	0		0	0
07/31/2011	0		0	0
08/31/2011	0		0	0
09/30/2011	0		0	0
10/31/2011	1.945		17.69	0.56
11/30/2011	2.365		27.1	0.59
12/31/2011	0.84		34.06	0.37
01/31/2012	1.12		35.18	0.484
02/29/2012	1.45		32.29	0.216
03/31/2012	0		0	0
04/30/2012	0		0	0
05/31/2012	0		0	0
06/30/2012	0		0	0
07/31/2012	0		0	0
08/31/2012	0		0	0
09/30/2012	0		0	0
10/31/2012	0.45		35.86	0.94
11/30/2012	0.996		38.35	0.439
12/31/2012	1.2855		33.13	0.485
01/31/2013	1.4055		33.03	0.288
02/28/2013	0.782		22.85	0.26
03/31/2013	0		0	0
04/30/2013	0		0	0
05/31/2013	0		0	0
06/30/2013	0		0	0
07/31/2013	0		0	0
08/31/2013	0		0	0
09/30/2013	0		0	0
10/31/2013	1.525		28.11	0.583
11/30/2013	1.7165		28.04	0.33
12/31/2013	1.7465		33.37	0.134
01/31/2014	2.373		30.61	0.269
02/28/2014	1.474		26.27	0.424
03/31/2014	0		0	0
04/30/2014	0		0	0
05/31/2014	0		0	0
06/30/2014	0		0	0
07/31/2014				
08/31/2014				
Average	**0.729**		**13.365**	**0.197**
Median	**0.000**		**0.000**	**0.000**
90th Percentile	**2.371**		**35.159**	**0.558**
Summer Ave.	**0.241**		**2.880**	**0.046**
	gpcd ave	gpcd max	removal	removal

Cenex Harvest WWTP				MT0000264
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	Ammonia Ave	Ammonia Max
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010 Averag	1.17	1.21	7.25	10.08
02/28/2010 Averag	1.06	1.19	4.33	10.3
03/31/2010 Averag	1.15	1.32		
04/30/2010 Averag	0.99	1.35		
05/31/2010 Averag	0.81	1.01	0.08	0.11
06/30/2010 Averag	0.79	1.31		
07/31/2010 Averag	1.23	1.56	0.3	0.58
08/31/2010 Averag	1.35	1.63	0.07	0.09
09/30/2010 Averag	1.29	1.63	0.1	0.22
10/31/2010 Averag	1.29	1.76	0.19	0.55
11/30/2010 Averag	1.46	2.17		
12/31/2010 Averag	1.25	1.89	1.55	3.98
01/31/2011 Averag	1.1	1.33	5.5	8.2
02/28/2011 Averag	1.28	2.15	0.29	0.9
03/31/2011 Averag	1.19	1.56		
04/30/2011 Averag	1.21	1.94		
05/31/2011 Averag	1.17	2.02	0.33	0.62
06/30/2011 Averag	1.25	1.55		
07/31/2011 Averag	1.22	1.66		
08/31/2011 Averag	1.39	1.64		
09/30/2011 Averag	1.31	2.09		
10/31/2011 Averag	1.31	2.09	0.11	0.24
11/30/2011 Averag	1.25	1.71	0.49	1
12/31/2011 Averag	1.22	2.16		
01/31/2012 Averag	1.17	2.02	0.09	0.14
02/29/2012 Averag	1.24	1.8	0.08	0.11
03/31/2012 Averag	1.14	1.56		
04/30/2012 Averag	1.3	1.8		
05/31/2012 Averag	1.44	1.71		
06/30/2012 Averag	1.36	2.03	0.09	0.13
07/31/2012 Averag	1.42	2.13		
08/31/2012 Averag	1.39	1.58	0.22	0.83
09/30/2012 Averag	1.34	1.67		
10/31/2012 Averag	1.42	1.91		
11/30/2012 Averag	1.34	1.53	0.57	2.07
12/31/2012 Averag	1.42	2.09	0.14	0.34
01/31/2013 Averag	1.48	1.93	0.08	0.11
02/28/2013 Averag	1.12	1.53	3.94	12.8
03/31/2013 Averag	1.39	1.97		
04/30/2013 Averag	1.35	1.99	0.25	0.62
05/31/2013 Averag	1.03	1.9	3.27	7.4
06/30/2013 Averag	1.3	1.77	10.63	23.4
07/31/2013 Averag	1.52	1.79	0.52	0.95
08/31/2013 Averag	1.44	1.53	0.16	0.34
09/30/2013 Averag	1.51	2.1	0.31	0.92
10/31/2013 Averag	1.49	2.07	0.2	0.38
11/30/2013 Averag	1.37	1.55	2.26	7.72
12/31/2013 Averag	1.48	1.66	0.84	2.1
01/31/2014 Averag	1.41	1.8	0.45	1.31
02/28/2014 Averag	1.36	1.5		
03/31/2014 Averag	1.29	1.58		
04/30/2014 Averag	1.37	2.07		
05/31/2014 Averag	1.32	1.66		
06/30/2014 Averag	1.31	1.58	0.14	0.34
07/31/2014 Averag	1.28	1.66		
08/31/2014 Averag	1.39	1.8	2.23	8.57
Average	**1.284**	**1.736**	**1.426**	**3.256**
Median	**1.305**	**1.710**	**0.300**	**0.830**
90th Percentile	**1.450**	**2.090**	**4.252**	**9.778**
Summer Ave.	**1.363**	**1.748**	**0.489**	**1.563**
	gpcd ave	gpcd max	removal	removal

Barretts Minerals Treasure Mine				MT0029891
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.50	0.50	5.6	0.01
02/28/2010	0.58	0.58	7.1	0.04
03/31/2010	0.72	0.72	4.3	0.03
04/30/2010	0.50	0.50	3.5	0.03
05/31/2010	0.51	0.51	3	0.02
06/30/2010	1.31	1.31	2.6	0.02
07/31/2010	1.04	1.04	4.2	0.02
08/31/2010	0.82	0.82	5.2	0.01
09/30/2010	0.76	0.76	6	0.03
10/31/2010	0.50	0.50	8.1	0.01
11/30/2010	0.50	0.50	6.6	0.01
12/31/2010	0.54	0.54	4.4	0.03
01/31/2011	0.54	0.54	6	0.03
02/28/2011	0.52	0.52	4.8	0.02
03/31/2011	0.50	0.50	6.2	0.01
04/30/2011	0.72	0.72	4.1	0.02
05/31/2011	0.58	0.58	2.5	0.03
06/30/2011	0.76	0.76	2.5	0.02
07/31/2011	0.77	0.77	5.7	0.02
08/31/2011	0.42	0.42	4.9	0.04
09/30/2011	0.31	0.31	5.3	0.03
10/31/2011	0.35	0.35	6.3	0.03
11/30/2011	0.36	0.36	7.1	0.01
12/31/2011	0.36	0.36	7.51	0.06
01/31/2012	0.35	0.35	7.3	0.01
02/29/2012	0.16	0.16	7.9	0.01
03/31/2012	0.33	0.33	8.4	0.02
04/30/2012	0.36	0.36	7.7	
05/31/2012	0.55	0.55	6.3	0.01
06/30/2012	0.36	0.36	8.1	0.01
07/31/2012	0.18	0.18	7.6	0.02
08/31/2012	0.12	0.12	9.5	0.02
09/30/2012	0.11	0.14	9.4	0.01
10/31/2012	0.17	0.17	7.8	0.01
11/30/2012	0.14	0.14	7.5	0.01
12/31/2012	0.17	0.17	8.95	0.01
01/31/2013	0.14	0.14	8.9	0.02
02/28/2013	0.22	0.22	8	0.02
03/31/2013	0.11	0.11	8.4	0.02
04/30/2013	0.50	0.50	6.5	0.04
05/31/2013	0.85	0.85	7.7	0.02
06/30/2013	0.71	0.71	7.3	0.02
07/31/2013	0.30	0.30	8.6	0.01
08/31/2013	0.10	0.36	9.75	0.01
09/30/2013	0.52	0.52	8.7	0.02
10/31/2013	0.12	0.43	3.4	0.03
11/30/2013	0.10	0.35	8.9	
12/31/2013	0.36	0.50	10.1	0.02
01/31/2014	0.36	0.50	9	0.02
02/28/2014	0.36	0.50	5.9	0.03
03/31/2014	0.36	0.50	2.3	0.02
04/30/2014	0.55	0.55	7.2	0.03
05/31/2014	0.59	0.59	3.9	0.02
06/30/2014	0.67	0.67		
07/31/2014	0.52	0.52	3.9	0.05
08/31/2014	0.51	0.51	6.4	0.01
Average	**0.453**	**0.479**	**6.451**	**0.021**
Median	**0.504**	**0.504**	**6.600**	**0.020**
90th Percentile	**0.756**	**0.756**	**8.930**	**0.030**
Summer Ave.	**0.462**	**0.483**	**6.796**	**0.021**
	gpcd ave	gpcd max	removal	removal

Yellowstone Energy Limited Partnership				MT0030180
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.11	0.15		
02/28/2010	0.12	0.15		
03/31/2010	0.13	0.15		19.2
04/30/2010	0.13	0.15		
05/31/2010	0.11	0.13		
06/30/2010	0.12	0.22		2.54
07/31/2010	0.11	0.16		
08/31/2010	0.08	0.13		
09/30/2010	0.01	0.09		4.5
10/31/2010	0.10	0.16		
11/30/2010	0.12	0.17		
12/31/2010	0.11	0.16		2.47
01/31/2011	0.12	0.20		
02/28/2011	0.08	0.16		
03/31/2011	0.15	0.25		12.2
04/30/2011	0.03	0.15		
05/31/2011	0.14	0.24		
06/30/2011	0.16	0.20		1.1
07/31/2011	0.16	0.18		
08/31/2011	0.15	0.18		
09/30/2011	0.15	0.18		
10/31/2011	0.07	0.15		
11/30/2011	0.07	0.16		
12/31/2011	0.14	0.20		
01/31/2012	0.14	0.22		
02/29/2012	0.14	0.19		
03/31/2012	0.13	0.21		
04/30/2012	0.13	0.19		
05/31/2012	0.13	0.26		
06/30/2012	0.08	0.20		
07/31/2012	0.12	0.19		
08/31/2012	0.10	0.19		
09/30/2012	0.11	0.17		
10/31/2012	0.10	0.17		
11/30/2012	0.11	0.15		
12/31/2012	0.12	0.16		
01/31/2013	0.13	0.17		
02/28/2013	0.12	0.15		
03/31/2013	0.13	0.17		
04/30/2013	0.13	0.18		
05/31/2013	0.15	0.22		
06/30/2013	0.10	0.20		
07/31/2013	0.14	0.18		
08/31/2013	0.14	0.20		
09/30/2013	0.17	0.21		
10/31/2013	0.16	0.23		
11/30/2013	0.16	0.19		
12/31/2013	0.15	0.24		
01/31/2014	0.15	0.20		
02/28/2014	0.14	0.19		
03/31/2014	0.16	0.36		
04/30/2014	0.16	0.21		
05/31/2014	0.14	0.21		
06/30/2014	0.01	0.04		
07/31/2014	0.11	0.21		
08/31/2014	0.11	0.18		
Average	**0.120**	**0.184**		**7.002**
Median	**0.125**	**0.183**		**3.520**
90th Percentile	**0.158**	**0.225**		**15.700**
Summer Ave.	**0.118**	**0.176**		**4.500**
	gpcd ave	gpcd max	removal	removal

0010942

Montana Sulphur and Chemical				MT0000230
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
1/31/2010	2.95	3.04		
2/28/2010	3.10	3.29		
3/31/2010	2.93	3.08	2.2	0.04
4/30/2010	3.02	3.16		
5/31/2010	2.97	3.08		
6/30/2010	2.74	2.95	1.7	0.72
7/31/2010	2.62	2.94		
8/31/2010	2.84	3.05		
9/30/2010	2.75	3.09	2.2	0.04
10/31/2010	2.58	2.80		
11/30/2010	2.58	2.80		
12/31/2010	2.66	2.94	2.4	0.05
1/31/2011	2.94	3.11		
2/28/2011	2.65	3.14		
3/31/2011	2.76	3.17	2.4	0.04
4/30/2011	2.95	3.19		
5/31/2011	2.88	3.15		
6/30/2011	2.85	3.10	2.8	0.13
7/31/2011	2.83	2.92		
8/31/2011	2.62	2.93		
9/30/2011	2.75	3.03	4.2	0.49
10/31/2011	2.79	3.03		
11/30/2011	2.77	3.10		
12/31/2011	3.06	3.19	2.2	0.04
1/31/2012	3.09	3.16		
2/29/2012	3.00	3.10		
3/31/2012	2.79	3.00	2.5	0.04
4/30/2012	2.95	3.07		
5/31/2012	2.64	3.07		
6/30/2012	2.52	2.87	2.4	0.84
7/31/2012	2.32	2.49		
8/31/2012	2.41	2.55		
9/30/2012	2.43	2.63	3.1	0.03
10/31/2012	2.42	2.51		
11/30/2012	2.48	2.77		
12/31/2012	2.64	2.76	2.8	0.03
1/31/2013	2.82	3.11		
2/28/2013	3.03	3.08		
3/31/2013	3.01	3.03	2	0.1
4/30/2013	2.98	3.09		
5/31/2013	2.82	3.15		
6/30/2013	2.67	3.00	2.6	0.27
7/31/2013	2.67	2.90		
8/31/2013	2.92	2.98		
9/30/2013	2.70	2.78	3	0.06
10/31/2013	2.60	2.70		
11/30/2013	2.54	2.73		
12/31/2013	2.48	2.53	2.4	0.01
1/31/2014	2.34	2.47		
2/28/2014	2.14	2.24		
3/31/2014	2.23	2.30	3.2	0.04
4/30/2014	2.24	2.31		
5/31/2014	2.21	2.45		
6/30/2014	2.31	2.50		
7/31/2014	2.39	2.61		
8/31/2014	2.64	2.92		
Average	**2.697**	**2.895**	**2.594**	**0.175**
Median	**2.720**	**2.987**	**2.400**	**0.040**
90th Percentile	**3.006**	**3.155**	**3.140**	**0.582**
Summer Ave.	**2.635**	**2.844**	**3.125**	**0.155**
	gpcd ave	gpcd max	removal	removal

Bull Mountain Mine #1				MT0028983
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0	0		
02/28/2010	0	0		
03/31/2010	0	0		
04/30/2010	0	0		
05/31/2010	0	0		
06/30/2010	0	0		
07/31/2010	0	0		
08/31/2010	0	0		
09/30/2010	0	0		
10/31/2010	0	0		
11/30/2010	0	0		
12/31/2010	0	0		
01/31/2011	0	0		
02/28/2011	0	0		
03/31/2011	0	0		
04/30/2011	0	0		
05/31/2011	0.74	1.75		
06/30/2011	0.52	1.55		
07/31/2011	0	0		
08/31/2011	0	0		
09/30/2011	0	0		
10/31/2011	0	0		
11/30/2011	0	0		
12/31/2011	0	0		
01/31/2012	0	0		
02/29/2012	0	0		
03/31/2012	0	0		
04/30/2012	0	0		
05/31/2012	0	0		
06/30/2012	0	0		
07/31/2012	0	0		
08/31/2012	0	0		
09/30/2012	0	0		
10/31/2012	0	0		
11/30/2012	0	0		
12/31/2012	0	0		
01/31/2013	0	0		
02/28/2013	0	0		
03/31/2013	0	0		
04/30/2013	0	0		
05/31/2013	31.29	64.78	2.294	0.252
06/30/2013	0.91	1.12	2.215	0.095
07/31/2013	0	0		
08/31/2013	0.31	0.32	0.51	0.01
09/30/2013	0	0		
10/31/2013	0.320	0.032	1.17	0.01
11/30/2013	0.57	0.57	1.1	0.01
12/31/2013	0.72	0.72	1.8	0.18
01/31/2014	0	0		
02/28/2014	0	0		
03/31/2014	0	0		
04/30/2014	0	0		
05/31/2014	0	0		
06/30/2014	0	0		
07/31/2014	0	0		
08/31/2014	13.797	13.797	18.59	0.33
Average	**0.878**	**1.511**	**3.954**	**0.127**
Median	**0.000**	**0.000**	**1.800**	**0.095**
90th Percentile	**0.543**	**0.645**	**8.812**	**0.283**
Summer Ave.	**1.008**	**1.009**	**9.550**	**0.170**
	gpcd ave	gpcd max	removal	removal

Montana Behavioral Health				MT0021431
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0	0.01	32.2	10.1
02/28/2010	0	0.01	39.3	10.4
03/31/2010	0	0	38.5	7.72
04/30/2010	0	0.01	33.4	6.25
05/31/2010	0.01	0.01	23.7	5.87
06/30/2010	0.01	0.01	18.7	3.96
07/31/2010	0.01	0.01	32.5	3.72
08/31/2010	0.01	0.01	32.7	2.46
09/30/2010	0.01	0.01	33.6	0.73
10/31/2010	0	0.01	32	5.9
11/30/2010	0.01	0.01	31.9	4.3
12/31/2010	0	0.01	28	5.06
01/31/2011	0	0	30.6	6.03
02/28/2011	0	0.01	25.6	5.15
03/31/2011	0	0.01	39.5	5.79
04/30/2011	0	0	36.9	7.4
05/31/2011	0	0.01	33.6	6.85
06/30/2011	0	0.01	28.9	7.62
07/31/2011	0	0.01	37.2	7.97
08/31/2011	0.01	0.01	22.7	4.75
09/30/2011	0.01	0.01	16	3.7
10/31/2011	0.01	0.01	6.43	3.46
11/30/2011	0.01	0.01	23.5	2.36
12/31/2011	0.01	0.01	24.7	3.43
01/31/2012	0.01	0.01	28	4.51
02/29/2012	0.01	0.01	29.6	4.3
03/31/2012	0.01	0.01	29.1	5.3
04/30/2012	0.01	0.01	32.3	5.68
05/31/2012	0.01	0.01	31.2	6.31
06/30/2012	0.01	0.01	29	6.98
07/31/2012	0.01	0.02	22.9	5.25
08/31/2012	0.01	0.01	16.1	2.74
09/30/2012	0.01	0.01	17.7	2.34
10/31/2012	0.01	0.01		
11/30/2012	0.01	0.01		
12/31/2012	0	0.01		
01/31/2013	0	0.01		
02/28/2013	0	0		
03/31/2013	0	0.01		
04/30/2013	0	0.01		
05/31/2013	0	0.02		
06/30/2013	0	0.01	39.3	6.17
07/31/2013	0	0.01	34.9	8.56
08/31/2013	0	0	30	7.17
09/30/2013	0	0.01	27.2	6.08
10/31/2013	0	0.01		
11/30/2013	0	0		
12/31/2013	0	0.03		
01/31/2014	0	0		
02/28/2014	0	0		
03/31/2014	0	0.01		
04/30/2014	0	0		
05/31/2014	0	0.02		
06/30/2014	0	0.01	41.3	8.02
07/31/2014	0	0.02	38.4	9.18
08/31/2014	0	0.01	28.3	8.02
Average	**0.004**	**0.009**	**29.436**	**5.690**
Median	**0.000**	**0.010**	**30.300**	**5.830**
90th Percentile	**0.010**	**0.010**	**38.580**	**8.074**
Summer Ave.	**0.006**	**0.011**	**27.871**	**5.191**
	gpcd ave	gpcd max	removal	removal

Decker East Mine				MT0024210
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	1.14	1.36	1.8	
02/28/2010	1.09	1.65	2.3	0.01
03/31/2010	1.42	2.08	1.3	
04/30/2010	1.36	2.40	5.6	0.01
05/31/2010	1.89	2.47	2.7	0.02
06/30/2010	1.83	2.47	2.2	0.02
07/31/2010	1.59	2.27	1.9	0.01
08/31/2010	1.65	2.40	2.2	0.01
09/30/2010	1.25	2.27	1.3	
10/31/2010	1.25	2.40	1.7	
11/30/2010	1.36	1.95	2.4	0.01
12/31/2010	1.31	1.59	1.6	
01/31/2011	1.36	1.95	1.5	0.01
02/28/2011	1.25	1.83	1.5	
03/31/2011	1.42	1.95	2.1	
04/30/2011	1.25	2.40	3.3	
05/31/2011	1.89	2.54	2.5	0.02
06/30/2011	1.89	2.47	5.2	0.01
07/31/2011	1.89	2.54	3	
08/31/2011	1.36	2.47	2.6	
09/30/2011	1.53	2.47	5.3	
10/31/2011	1.53	2.60	2.5	0.01
11/30/2011	1.31	2.47	2.1	0.02
12/31/2011	1.14	1.77	1.8	0.01
01/31/2012	1.42	2.54	2.1	
02/29/2012	1.14	1.59	1.4	
03/31/2012	1.59	2.47	1.8	
04/30/2012	1.47	2.40	2.1	
05/31/2012	1.59	2.08	2.52	0.01
06/30/2012	1.71	2.28	2.83	0.01
07/31/2012	1.65	2.22	1.9	
08/31/2012	1.47	1.88	2.5	0.02
09/30/2012	1.25	1.67	2.37	0.01
10/31/2012	1.36	2.04	2.3	0.01
11/30/2012	1.25	1.55	2.5	0.01
12/31/2012	1.31	1.46	2.5	0.01
01/31/2013	1.14	1.51	2.4	
02/28/2013	1.14	1.52	2.2	0.01
03/31/2013	1.36	1.56	2.7	
04/30/2013	1.71	2.25	2.5	
05/31/2013	1.71	2.28	2.5	
06/30/2013	1.71	2.81	1.8	0.01
07/31/2013	1.59	2.08	1.4	
08/31/2013	1.59	2.02	1.8	0.01
09/30/2013	1.53	2.08	1.8	
10/31/2013	1.71	2.27	1.9	0.01
11/30/2013	1.59	2.34	1.6	
12/31/2013	1.83	2.88	1.7	0.01
01/31/2014	1.59	2.68	2.7	0.01
02/28/2014	1.31	2.95	1.5	0.01
03/31/2014	2.14	3.02	2	0.02
04/30/2014	1.53	2.74	1.9	0.01
05/31/2014	1.36	2.54	1.6	
06/30/2014	1.83	4.21	2	0.01
07/31/2014	1.89	2.68	1.9	
08/31/2014	1.71	3.17	1.3	0.02
Average	**1.503**	**2.260**	**2.258**	**0.012**
Median	**1.502**	**2.280**	**2.100**	**0.010**
90th Percentile	**1.860**	**2.775**	**2.765**	**0.020**
Summer Ave.	**1.569**	**2.301**	**2.234**	**0.013**
	gpcd ave	gpcd max	removal	removal

Decker West Mine				MT0000892
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.00	8.52	1.2	0.02
02/28/2010	0.00	12.53	1.1	0.02
03/31/2010	0.00	7.30	0.6	0.03
04/30/2010	0.00	6.86	1.6	0.01
05/31/2010	0.00	5.95	0.6	0.02
06/30/2010	0.00	12.84	0.5	0.02
07/31/2010	0.00	10.79	0.5	0.03
08/31/2010	0.12	9.46	2.6	0.035
09/30/2010	0.05	9.02	1.6	0.025
10/31/2010	0.00	6.08	0.8	0.02
11/30/2010	0.05	8.73	1.8	0.02
12/31/2010	0.01	5.46	2.1	0.035
01/31/2011	0.00	3.24	1	0.02
02/28/2011	0.00	3.59	1.1	0.02
03/31/2011	0.00	5.58	0.3	0.02
04/30/2011	0.00	8.80	2.2	0.02
05/31/2011	0.05	10.28	1.3	0.025
06/30/2011	0.36	11.67	2.6	0.025
07/31/2011	0.02	7.55	3.15	0.025
08/31/2011	0.36	7.23	0.7	0.02
09/30/2011	0.00	5.65		0.02
10/31/2011	0.00	5.79	4.6	0.02
11/30/2011	0.00	5.13	1.4	0.02
12/31/2011	0.00	6.27	1	0.03
01/31/2012	0.00	4.75	0.3	0.01
02/29/2012	0.00	4.94	0.7	0.01
03/31/2012	0.01	8.96	1.2	0.01
04/30/2012	0.10	11.76	1.35	0.025
05/31/2012	0.00	0.00	0.51	0.02
06/30/2012	0.00	0.00	0.76	0.02
07/31/2012	0.00	0.00	0.62	0.01
08/31/2012	0.00	0.00	0.7	0.03
09/30/2012	0.00	0.00	0.91	0.03
10/31/2012	0.00	0.00	0.7	
11/30/2012	0.00	0.00	0.9	0.03
12/31/2012	0.00	0.00	1	0.02
01/31/2013	0.00	0.00	0.9	0.02
02/28/2013	0.00	0.00	0.4	0.01
03/31/2013	0.00	0.00	1	0.02
04/30/2013	0.00	0.00	1	0.02
05/31/2013	0.00	0.00	0.8	0.02
06/30/2013	0.00	0.00	1	0.03
07/31/2013	0.00	0.00	0.5	0.04
08/31/2013	0.00	0.00	4.3	0.02
09/30/2013	0.00	0.00	0.9	0.03
10/31/2013	0.00	0.00	0.8	0.03
11/30/2013	0.00	0.00	0.4	0.03
12/31/2013	0.00	0.00	0.3	0.03
01/31/2014	0.00	0.00	0.4	0.02
02/28/2014	0.00	0.00		0.03
03/31/2014	0.00	0.00	0.4	0.03
04/30/2014	0.00	0.00	1.15	0.04
05/31/2014	0.00	0.00	0.8	0.03
06/30/2014	0.00	0.00	0.9	0.03
07/31/2014	0.00	0.00	0.9	0.02
08/31/2014	0.00	0.00	0.7	0.025
Average	**0.021**	**3.835**	**1.140**	**0.023**
Median	**0.000**	**1.622**	**0.900**	**0.020**
90th Percentile	**0.052**	**9.873**	**2.170**	**0.030**
Summer Ave.	**0.040**	**3.551**	**1.391**	**0.026**
	gpcd ave	gpcd max	removal	removal

Fidelity - Tongue River Project				MT0030724
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.66	0.66	0.8	0.1
02/28/2010	0.65	0.65	0.6	0.1
03/31/2010	0.909221902	0.995677233	0.2	0.09
04/30/2010	0.737752161	0.962536023	1.1	0.08
05/31/2010	0.694524496	0.737752161		0.09
06/30/2010	0.720461095	0.825648415	0.2	0.09
07/31/2010	0.94092219	1.321325648	0.3	0.09
08/31/2010	0.922190202	0.956772334	0.4	0.09
09/30/2010	0.991354467	1.645533141	0.3	0.1
10/31/2010	0.995677233	1.390489914	1	0.11
11/30/2010				
12/31/2010	1.17	1.195	0.4	
01/31/2011	1.145	1.18	0.4	
02/28/2011	1.115	1.165	0.8	
03/31/2011	1.495	2.205	1.35	
04/30/2011	1.045	1.09	0.8	
05/31/2011	2.125	2.28	1.6	
06/30/2011	1.135	1.16	0.9	
07/31/2011	1.71	2.245	1.25	
08/31/2011	1.035	1.125	0.8	
09/30/2011	0.915	1	0.3	
10/31/2011	0.925	0.98	1	
11/30/2011	0.945	1.04	1.1	
12/31/2011	0.925	0.975	1.1	
01/31/2012	0.89	1	1	
02/29/2012	0.905	1.005	0.8	
03/31/2012	0.835	1.1	0.7	
04/30/2012	0.465	0.505	0.9	
05/31/2012	0.45	0.465	0.6	
06/30/2012	0.45	0.455	1.1	
07/31/2012	0.425	0.455	0.8	
08/31/2012	0.435	0.5	0.8	
09/30/2012	0.475	0.545	0.9	
10/31/2012	0.475	0.52	1.2	
11/30/2012	0.485	0.535	0.9	
12/31/2012	0.5	0.55	0.8	
01/31/2013	0.47	0.535	1	
02/28/2013	0.475	0.56	0.9	
03/31/2013	0.435	0.47	1	
04/30/2013	0.41	0.435	1.2	
05/31/2013	0.415	0.44	1.1	
06/30/2013	0.47	0.61	0	
07/31/2013	0	0		
08/31/2013	0	0		
09/30/2013	0	0		
10/31/2013	0	0		
11/30/2013	0	0		
12/31/2013	0	0		
01/31/2014	0	0		
02/28/2014	0	0		
03/31/2014	0	0		
04/30/2014	0	0		
05/31/2014	0	0		
06/30/2014	0	0		
07/31/2014	0	0		
08/31/2014	0	0		
Average	**0.607**	**0.699**	**0.810**	**0.094**
Median	**0.485**	**0.560**	**0.850**	**0.090**
90th Percentile	**1.127**	**1.271**	**1.200**	**0.101**
Summer Ave.	**0.561**	**0.700**	**0.650**	**0.093**
	gpcd ave	gpcd max	removal	removal

REC Advanced Silicon Materials				MT0030350
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.74	0.82		
02/28/2010	0.75	0.82		
03/31/2010	0.72	0.89		
04/30/2010	0.73	0.82		
05/31/2010	0.74	0.85		
06/30/2010	0.75	0.92		
07/31/2010	0.72	0.82		
08/31/2010	0.73	0.85		
09/30/2010	0.74	0.89		
10/31/2010	0.75	0.89		
11/30/2010	0.75	0.89		0.28
12/31/2010	0.73	0.85		0.2
01/31/2011	0.83	0.89		0.28
02/28/2011	0.82	0.89	1.2	0.27
03/31/2011	0.89	1.15		0.35
04/30/2011	0.94	1.07		0.37
05/31/2011	0.87	1.01		0.05
06/30/2011	0.91	1.01		0.03
07/31/2011	0.92	1.04		0.17
08/31/2011	0.9	1.12		0.21
09/30/2011	0.83	1.01		0.2
10/31/2011	0.84	0.92	0.5	0.2
11/30/2011	0.89	1.03		0.21
12/31/2011	0.84	0.96		0.17
01/31/2012	0.82	0.97		0.19
02/29/2012	0.82	1.45		0.09
03/31/2012	0.85	1.06		0.16
04/30/2012	0.87	1.07		0.13
05/31/2012	0.84	1.45	0.3	0.15
06/30/2012	0.82	1.45	0.06	0.14
07/31/2012	0.87	1.16	0.3	0.22
08/31/2012	0.88	1.45		0.24
09/30/2012	0.84	1.44		0.18
10/31/2012	0.89	1.1		0.2
11/30/2012	0.89	1.11		0.17
12/31/2012	0.86	1.06		0.2
01/31/2013	0.87	1.03		0.24
02/28/2013	0.87	1.06		0.18
03/31/2013	0.85	1.1		0.22
04/30/2013	0.88	1.06	0.2	0.22
05/31/2013	0.84	1.05		0.18
06/30/2013	0.8	1.08	0.2	0.18
07/31/2013	0.9	1.09		0.23
08/31/2013	0.87	1.05	0.2	0.29
09/30/2013	0.86	1.03	0.3	0.3
10/31/2013	0.84	0.97		0.33
11/30/2013	0.81	1.02	0.3	0.34
12/31/2013	0.72	1.44	0.4	0.35
01/31/2014	0.74	1.01	0.3	0.34
02/28/2014	0.91	1.03	0.2	0.26
03/31/2014	0.82	0.94		0.25
04/30/2014	0.85	1		0.27
05/31/2014	0.87	0.99	0.4	0.3
06/30/2014	0.89	0.99	0.2	0.3
07/31/2014	0.91	0.99	0.3	0.36
08/31/2014	0.87	0.97	0.3	0.23
Average	**0.831**	**1.037**	**0.333**	**0.227**
Median	**0.840**	**1.015**	**0.300**	**0.220**
90th Percentile	**0.900**	**1.300**	**0.440**	**0.340**
Summer Ave.	**0.846**	**1.065**	**0.280**	**0.239**
	gpcd ave	gpcd max	removal	removal

ASARCO EAST HELENA				MT0030147
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0	0		
02/28/2010	0	0		
03/31/2010	0.088178	0.118311		
04/30/2010	0	0		
05/31/2010	0.090833	0.120385		
06/30/2010	0.090833	0.120385		
07/31/2010	0.080828	0.111896		
08/31/2010	0.104173	0.109421		
09/30/2010	0.088211	0.111354		
10/31/2010	0.113413	0.136994		
11/30/2010	0	0		
12/31/2010	0.117127	0.126134		
01/31/2011	0.114678	0.130768		
02/28/2011	0	0		
03/31/2011	0.090794	0.10744		
04/30/2011	0.107548	0.127014		
05/31/2011	0.122161	0.127112		
06/30/2011	0.10069	0.123696		
07/31/2011	0.10205	0.139257		
08/31/2011	0	0		
09/30/2011	0	0		
10/31/2011	0.110096	0.139073		
11/30/2011	0.077443	0.13149		
12/31/2011	0	0		
01/31/2012	0	0		
02/29/2012	0.106893	0.137845		
03/31/2012	0.108224	0.138596		
04/30/2012	0	0		
05/31/2012	0	0		
06/30/2012	0.127201	0.14079		
07/31/2012	0	0		
08/31/2012	0	0		
09/30/2012	0	0		
10/31/2012	0.077034	0.118241		
11/30/2012	0	0		
12/31/2012	0.089293	0.122064		
01/31/2013	0	0		
02/28/2013	0.033509	0.046273		
03/31/2013	0	0		
04/30/2013	0	0		
05/31/2013	0	0		
06/30/2013	0.091945	0.138721		
07/31/2013	0.120048	0.12752		
08/31/2013	0.108579	0.129087		
09/30/2013	0.107133	0.107133		
10/31/2013	0.108682	0.128403		
11/30/2013	0	0		
12/31/2013	0	0		
01/31/2014	0	0		
02/28/2014	0.077435	0.118951		
03/31/2014	0.09863	0.124889		
04/30/2014	0.077717	0.098554		
05/31/2014	0.073404	0.112675		
06/30/2014	0	0		
07/31/2014	0.064901	0.099014		
08/31/2014	0.094361	0.112388		
Average	**0.057**	**0.071**		
Median	**0.077**	**0.108**		
90th Percentile	**0.112**	**0.137**		
Summer Ave.	**0.062**	**0.075**		
	gpcd ave	gpcd max	removal	removal

Elkhorn Rehabilitation Center				MT0030350
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.02	0.02	21.3	0.71
02/28/2010	0.01	0.02	59.9	3.65
03/31/2010	0.01	0.02	16.2	1.2
04/30/2010	0.01	0.02	16.3	0.8
05/31/2010	0.01	0.02	16.75	1
06/30/2010	0.01	0.02	16.8	1.1
07/31/2010	0.01	0.02	21.5	1.44
08/31/2010	0.01	0.01	21.8	2.53
09/30/2010	0.01	0.02	23.8	3.59
10/31/2010	0	0	21.4	2.8
11/30/2010	0	0.01	59.9	3.65
12/31/2010	0.01	0.02	25	4
01/31/2011	0.01	0.02	34	2.89
02/28/2011	0	0	36	3.23
03/31/2011	0	0	50.18	3.64
04/30/2011	0	0	21.3	2.23
05/31/2011	0	0	14.9	1.2
06/30/2011	0	0	14.07	1.81
07/31/2011	0	0	22.06	2.83
08/31/2011	0	0	21.12	2.43
09/30/2011	0	0	18.19	2.59
10/31/2011	0	0	13.55	2.69
11/30/2011	0	0.02	14.82	2.67
12/31/2011			16.15	2.36
01/31/2012	0	0	17.37	2.6
02/29/2012	0	0	21.7	2.53
03/31/2012	0	0	15.8	2.6
04/30/2012	0	0	14.1	2.5
05/31/2012	0	0	13.6	2.8
06/30/2012	0	0	14.5	1.76
07/31/2012	0	0	14.5	3.23
08/31/2012	0	0	8.5	4.84
09/30/2012	0	0	10.1	2.5
10/31/2012	0	0	9.1	2.2
11/30/2012	0	0	28.4	3
12/31/2012	0	0	21.5	2.9
01/31/2013	0	0	9.5	1.4
02/28/2013	0	0	13.6	4.1
03/31/2013	0	0	50.5	3.1
04/30/2013	0	0	20.7	2.54
05/31/2013	0	0	13.53	1.07
06/30/2013	0	0		2.1
07/31/2013	0	0		2.41
08/31/2013	0	0	11.06	2.8
09/30/2013	0	0	9.3	1.92
10/31/2013	0	0	15.05	3.15
11/30/2013	0	0	23.71	3.7
12/31/2013	0	0	25.92	5.13
01/31/2014	0	0	39.4	3.9
02/28/2014	0	0	26.3	2.15
03/31/2014	0	0	25.94	3.7
04/30/2014	0	0	19.84	4.14
05/31/2014	0	0	19.2	5.02
06/30/2014	0	0	18.8	3.87
07/31/2014	0	0	18.3	2.2
08/31/2014	0.08	0	4.08	1.17
Average	**0.004**	**0.004**	**21.313**	**2.680**
Median	**0.000**	**0.000**	**18.550**	**2.600**
90th Percentile	**0.010**	**0.020**	**35.400**	**3.950**
Summer Ave.	**0.008**	**0.004**	**15.716**	**2.606**
	gpcd ave	gpcd max	removal	removal

BN Whitefish Facility				MT0000019
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0	0		
02/28/2010	0	0		
03/31/2010	0	0		
04/30/2010	0	0		
05/31/2010	0.02	0.04		0.01
06/30/2010	0.12	0.32		0.01
07/31/2010	0	0		
08/31/2010	0.08	0.12	2.01	0.03
09/30/2010	0	0		
10/31/2010	0	0		
11/30/2010	0	0		
12/31/2010	0	0		
01/31/2011	0	0		
02/28/2011	0	0		
03/31/2011	0.03	0.26		0.01
04/30/2011	0.1	0.25		0.01
05/31/2011	0.03	0.06		0.01
06/30/2011	0.05	0.17		0.01
07/31/2011	0.05	0.24		0.01
08/31/2011	0	0		
09/30/2011				
10/31/2011	0	0		
11/30/2011	0	0		
12/31/2011	0	0		
01/31/2012	0	0		
02/29/2012	0	0		
03/31/2012	0	0		
04/30/2012	0.13	0.36		0.02
05/31/2012	0.09	0.23		0.02
06/30/2012	0	0		
07/31/2012	0.1	0.24		0.02
08/31/2012	0.1	0.15		0.02
09/30/2012	0	0		
10/31/2012	0	0		
11/30/2012	0	0		
12/31/2012	0	0		
01/31/2013	0	0		
02/28/2013	0.04	0.27		0.01
03/31/2013	0.03	0.05		0.01
04/30/2013	0.02	0.04		0.01
05/31/2013	0.05	0.1		0.01
06/30/2013	0	0		
07/31/2013	0.15	0.23	0.5	0.02
08/31/2013	0	0		
09/30/2013	0	0		
10/31/2013	0	0		
11/30/2013	0	0		
12/31/2013	0	0		
01/31/2014	0	0		
02/28/2014	0.03	0.04	0.02	
03/31/2014	0.13	0.33		0.04
04/30/2014	0.11	0.31		0.03
05/31/2014	0	0		
06/30/2014	0	0		
07/31/2014	0.23	0.39	0.6	0.01
08/31/2014	0.02	0.02	0.6	0.01
Average	**0.031**	**0.077**	**0.746**	**0.016**
Median	**0.000**	**0.000**	**0.600**	**0.010**
90th Percentile	**0.106**	**0.266**	**1.446**	**0.030**
Summer Ave.	**0.056**	**0.107**	**0.928**	**0.017**
	gpcd ave	gpcd max	removal	removal

Stillwater Mining Company - Stillwater Mine				MT0024716
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.17	0.29	3.50	0.03
02/28/2010	0.16	0.28	0.52	0.04
03/31/2010	0.06	0.09	1.33	0.05
04/30/2010	0.17	0.66	2.04	0.04
05/31/2010	0.29	0.53	4.74	0.02
06/30/2010	0.14	0.19	0.52	
07/31/2010	0.15	0.19	0.51	
08/31/2010	0.17	0.22	0.73	0.10
09/30/2010	0.18	0.20	1.09	0.02
10/31/2010	0.16	0.20	0.50	0.01
11/30/2010	0.17	0.20	0.35	
12/31/2010	0.16	0.20	0.41	0.08
01/31/2011	0.14	0.19	0.41	0.03
02/28/2011	0.14	0.17	0.40	
03/31/2011	0.13	0.16	0.42	0.09
04/30/2011	0.14	0.26	0.39	
05/31/2011	0.14	0.21	0.48	0.01
06/30/2011	0.26	0.55	7.10	0.03
07/31/2011	0.21	0.40	0.43	0.01
08/31/2011	0.27	0.36	0.34	0.04
09/30/2011	0.25	0.50	0.37	0.01
10/31/2011	0.23	0.28	0.37	0.01
11/30/2011	0.22	0.28	0.38	0.01
12/31/2011	0.18	0.23	0.39	0.01
01/31/2012	0.15	0.21	0.41	0.01
02/29/2012	0.14	0.17	0.38	0.01
03/31/2012	0.14	0.17	0.37	
04/30/2012	0.14	0.16	0.35	0.01
05/31/2012	0.10	0.14	0.32	0.01
06/30/2012	0.12	0.22	0.24	0.01
07/31/2012	0.16	0.45	0.34	0.01
08/31/2012	0.14	0.18	0.37	0.01
09/30/2012	0.15	0.18	0.38	0.01
10/31/2012	0.15	0.20	0.38	0.01
11/30/2012	0.14	0.20	0.43	0.01
12/31/2012	0.16	0.20	0.43	0.01
01/31/2013	0.16	0.19	0.44	0.01
02/28/2013	0.17	0.27	0.43	0.01
03/31/2013	0.22	0.26	0.44	0.01
04/30/2013	0.36	0.68	6.80	0.02
05/31/2013	0.17	0.63	2.26	0.01
06/30/2013	0.14	0.16	0.56	0.01
07/31/2013	0.14	0.21	0.51	0.01
08/31/2013	0.13	0.16	0.46	0.01
09/30/2013	0.10	0.17	0.42	0.01
10/31/2013	0.06	0.11	0.41	0.01
11/30/2013	0.06	0.12	0.51	0.01
12/31/2013	0.06	0.08	0.45	0.01
01/31/2014	0.06	0.13	0.46	0.01
02/28/2014	0.06	0.09	0.40	0.01
03/31/2014	0.33	0.65	7.40	0.02
04/30/2014	0.33	0.49	5.67	0.02
05/31/2014	1.20	0.50	1.90	0.03
06/30/2014	0.22	0.46	6.45	0.03
07/31/2014	0.17	0.55	1.47	0.02
08/31/2014	0.15	0.54	5.47	0.01
Average	**0.184**	**0.282**	**1.340**	**0.021**
Median	**0.155**	**0.207**	**0.436**	**0.010**
90th Percentile	**0.266**	**0.545**	**5.108**	**0.040**
Summer Ave.	**0.169**	**0.307**	**0.921**	**0.021**
	gpcd ave	gpcd max	removal	removal

Stillwater Mining Company - East Boulder Mine				MT0026808
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.01	0.11	3.34	2.73
02/28/2010	0.04	0.22	2.55	1.7
03/31/2010	0.05	0.22	3.86	3.58
04/30/2010	0.05	0.21	2.09	1.55
05/31/2010	0.07	0.22	4.15	2.58
06/30/2010	0.16	0.21	4.37	3.03
07/31/2010	0.15	0.22	2.6	2.43
08/31/2010	0.12	0.21	2.6	2.42
09/30/2010	0.11	0.22	2.67	2.38
10/31/2010	0.10	0.22	2.15	1.51
11/30/2010	0.11	0.25	5.09	3.12
12/31/2010	0.07	0.22	1.83	1
01/31/2011	0.06	0.18	6.96	3.85
02/28/2011	0.03	0.17	2.39	1.06
03/31/2011	0.07	0.21	8.9	3.37
04/30/2011	0.08	0.21	5.72	2.83
05/31/2011	0.10	0.27	2.99	1.72
06/30/2011	0.29	0.35	4.05	2.34
07/31/2011	0.28	0.29	3.08	1.83
08/31/2011	0.26	0.30	2.91	2.9
09/30/2011	0.24	0.26	2.04	0.97
10/31/2011	0.22	0.26	5.01	1.49
11/30/2011	0.19	0.27	5.6	4.36
12/31/2011	0.19	0.27	8.39	3.67
01/31/2012	0.18	0.24	4.89	1.91
02/29/2012	0.18	0.26	4.47	1.97
03/31/2012	0.15	0.26	2.88	1.74
04/30/2012	0.16	0.26	4.4	2.4
05/31/2012	0.23	0.28	1.73	2.67
06/30/2012	0.26	0.29	4.06	2.54
07/31/2012	0.24	0.30	4.76	3.76
08/31/2012	0.27	0.40	2.97	2.14
09/30/2012	0.26	0.38	2.27	1.6
10/31/2012	0.24	0.36	2.8	2.04
11/30/2012	0.24	0.36	1.46	1.53
12/31/2012	0.34	0.38	1.94	1.56
01/31/2013	0.37	0.42	1.82	1.7
02/28/2013	0.34	0.39	0.46	0.82
03/31/2013	0.31	0.38	1.12	1.36
04/30/2013	0.32	0.36	5.67	3.22
05/31/2013	0.41	0.41	2.96	2.01
06/30/2013	0.38	0.41	2.9	1.85
07/31/2013	0.34	0.45	1.14	1.96
08/31/2013	0.32	0.45	1.54	2.07
09/30/2013	0.33	0.41	1.94	2
10/31/2013	0.35	0.38	1.97	165
11/30/2013	0.37	0.39	2.6	2
12/31/2013	0.38	0.38	2.65	1.76
01/31/2014	0.34	0.38	2.94	2.13
02/28/2014	0.20	0.39	2.21	1.99
03/31/2014	0.23	0.37	3.81	2.84
04/30/2014	0.20	0.39	1.69	2.12
05/31/2014	0.33	0.38	2.15	1.61
06/30/2014	0.42	0.45	3.49	2.78
07/31/2014	0.43	0.48	3.22	2.42
08/31/2014	0.43	0.46	2.74	2.37
Average	**0.226**	**0.312**	**3.268**	**5.148**
Median	**0.232**	**0.297**	**2.890**	**2.095**
90th Percentile	**0.378**	**0.418**	**5.345**	**3.475**
Summer Ave.	**0.271**	**0.345**	**2.606**	**2.232**
	gpcd ave	gpcd max	removal	removal

Beaverhead Talc Mine				MT0026808
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
03/31/2010	0			
06/30/2010	0.103680664	0.006796843		
09/30/2010	0.021600138	0.009172859		
12/31/2010	0			
03/31/2011	0			
06/30/2011	0.093600599	0.009648062		
09/30/2011	0.021600138	0.009072058		
12/31/2011	0			
03/31/2012	0			
06/30/2012	0.001080007	0.004132826		
09/30/2012	0			
12/31/2012	0			
03/31/2013	0			
06/30/2013	0			
09/30/2013	0			
12/31/2013	0			
03/31/2014	0			
06/30/2014	0.014400092	0.002764818		
09/30/2014	0.014400092	0.004334428		
Average	**0.014**	**0.007**		
Median	**0.000**	**0.007**		
90th Percentile	**0.036**	**0.009**		
	gpcd ave	gpcd max	removal	removal

MDU - Lewis and Clark Plant				MT0000302
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	32.67	32.68		
02/28/2010	32.64	32.66		
03/31/2010	32.55	32.66		
04/30/2010	28.16	32.54		
05/31/2010	28.44	32.55		
06/30/2010	32.63	32.7		
07/31/2010	32.52	32.6		
08/31/2010	30.68	32.73		
09/30/2010	32.59	32.75		
10/31/2010	28.72	32.67		
11/30/2010	32.63	32.69		
12/31/2010	32.27	32.68		
01/31/2011	32.66	32.71		
02/28/2011	32.37	32.68		
03/31/2011	31.92	32.69		
04/30/2011	24.98	32.64		
05/31/2011	27.52	32.78		
06/30/2011	32.65	32.67		
07/31/2011	32.71	32.76		
08/31/2011	32.24	32.57		
09/30/2011	32.65	32.79		
10/31/2011	26	32.27		
11/30/2011	32.57	32.61		
12/31/2011	32.33	32.55		
01/31/2012	32.23	32.54		
02/29/2012	32.33	32.54		
03/31/2012	30.53	32.54		
04/30/2012	22.81	32.52		
05/31/2012	15.57	32.72		
06/30/2012	27.47	32.7		
07/31/2012	32.18	32.55		
08/31/2012	32.47	32.47		
09/30/2012	31.44	32.64		
10/31/2012	27.82	32.67		
11/30/2012	32.38	32.64		
12/31/2012	29.19	32.61		
01/31/2013	27.97	32.58		
02/28/2013	30.66	32.57		
03/31/2013	32.54	32.56		
04/30/2013	32.11	64.31		
05/31/2013	23.4	32.74		
06/30/2013	0.99	1.05		
07/31/2013	32.4	32.61		
08/31/2013	32.52	32.57		
09/30/2013	32.07	32.5		
10/31/2013	27.01	32.61		
11/30/2013	32.52	32.56		
12/31/2013	30.7	32.54		
01/31/2014	32.43	32.57		
02/28/2014	32.34	32.55		
03/31/2014	30.53	32.55		
04/30/2014	23.92	64.19		
05/31/2014	32.14	32.57		
06/30/2014	29.57	32.67		
07/31/2014	32.32	32.61		
08/31/2014	31.17	32.52		
Average	**29.872**	**33.182**		
Median	**32.160**	**32.610**		
90th Percentile	**32.635**	**32.745**		
Summer Ave.	**32.140**	**32.619**		
	gpcd ave	gpcd max	removal	removal

Hinsdale WWTP				MT0020656
	Effluent Flow 30DA AVG	Effluent Flow DAILY MX	Effluent TN (mg/l)	Effluent TP (mg/l)
01/31/2010	0.01	0.01	1.2	0.03
02/28/2010	0.01	0.01	2	0.11
03/31/2010	0.02	0.02	1.4	0.04
04/30/2010	0.03	0.03	19	1.97
05/31/2010	0.03	0.03	12	1.5
06/30/2010	0.03	0.03	24.4	0.14
07/31/2010	0.03	0.03	10	0.71
08/31/2010	0.03	0.03	26	3.11
09/30/2010	0.01	0.03	28	2.97
10/31/2010	0.01	0.03	34	2.84
11/30/2010	0.01	0.02	26	2.55
12/31/2010	0.01	0.02	24	1.17
01/31/2011	0.01	0.03	18.4	1.06
02/28/2011	0.03	0.03	23.7	1.09
03/31/2011	0.01	0.03	28.2	1.32
04/30/2011	0.01	0.03	28.9	1.64
05/31/2011	0.01	0.03	28	2.19
06/30/2011	0.02	0.03	21	0.99
07/31/2011	0.01	0.03	22	0.83
08/31/2011	0.01	0.03	27.7	2.08
09/30/2011	0.01	0.03	14.4	0.6
10/31/2011	0.01	0.03	13.8	1.41
11/30/2011	0.01	0.03	3.8	0.59
12/31/2011	0.01	0.03	16.8	0.25
01/31/2012	0.01	0.03	19.7	0.39
02/29/2012	0.03	0.03	17	0.93
03/31/2012	0.03	0.03	17	0.93
04/30/2012	0.03	0.03	13	0.52
05/31/2012	0.02	0.02	14.4	0.49
06/30/2012	0.03	0.03	11.1	0.15
07/31/2012	0.02	0.02	5	0.52
08/31/2012	0.02	0.02	5.8	2.9
09/30/2012	0.02	0.03	24	5.9
10/31/2012	0.02	0.02	19	0.6
11/30/2012	0.02	0.03	13	3.83
12/31/2012	0.02	0.02	17	0.2
01/31/2013	0.02	0.03	18	0.17
02/28/2013	0.02	0.02	20	0.21
03/31/2013	0.02	0.03	25	0.92
04/30/2013	0.02	0.02	18	1.93
05/31/2013	0.02	0.03	22	0.65
06/30/2013	0.02	0.02	22	0.54
07/31/2013	0.02	0.03	31.2	0.76
08/31/2013	0.02	0.02	14.6	2.48
09/30/2013	0.03	0.03	3.5	0.8
10/31/2013	0.02	0.02	14.3	0.1
11/30/2013	0.02	0.02	10.2	0.14
12/31/2013	0.01	0.01	3.4	0.19
01/31/2014	0.01	0.09	11.9	0.6
02/28/2014	0.01	0.1	17.1	0.15
03/31/2014	0.01	0.09	10.8	0.35
04/30/2014	0.01	0.1	18.3	0.12
05/31/2014	0.01	0.1	12.4	1.38
06/30/2014	0.01	0.07	30.2	2.67
07/31/2014	0.01	0.07	22.7	0.17
08/31/2014	0.01	0.1	27.9	2.43
Average	**0.017**	**0.035**	**17.575**	**1.166**
Median	**0.020**	**0.030**	**18.000**	**0.780**
90th Percentile	**0.030**	**0.080**	**28.000**	**2.755**
Summer Ave.	**0.018**	**0.036**	**18.771**	**1.876**
Population	217	Influent->	35.0	7.00
	80	369	49%	89%
	gpcd ave	gpcd max	removal	removal

Columbia Falls WWTP				MT0020036
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.36	0.39		0.25
02/28/2010	0.34	0.38		0.3
03/31/2010	0.34	0.36		0.28
04/30/2010	0.34	0.42		0.23
05/31/2010	0.26	0.34	27.9	0.38
06/30/2010	0.33	0.48	19.9	0.45
07/31/2010	0.31	0.35	50.8	0.23
08/31/2010	0.24	0.3	25.4	0.23
09/30/2010	0.29	0.59	11.98	0.12
10/31/2010	0.3	0.37	5.98	0.05
11/30/2010	0.31	0.38	6.96	0.61
12/31/2010	0.33	0.57	8.57	0.1
01/31/2011	0.37	0.51	12.2	0.25
02/28/2011	0.37	0.52	11.57	0.86
03/31/2011	0.37	0.46	10.85	0.41
04/30/2011	0.44	0.7	11.28	0.17
05/31/2011	0.48	0.56	9.05	0.39
06/30/2011	0.57	0.68	8.1	0.77
07/31/2011	0.51	0.71	8.01	0.23
08/31/2011	0.43	0.48	11.2	0.12
09/30/2011	0.37	0.4	10.8	0.29
10/31/2011	0.35	0.39	11.06	1.12
11/30/2011	0.34	0.39	12.75	1.68
12/31/2011	0.36	0.39	7.66	0.91
01/31/2012	0.37	0.42	4.39	0.15
02/29/2012	0.37	0.46	7.05	0.61
03/31/2012	0.39	0.53	6.85	0.25
04/30/2012	0.38	0.49	7.12	0.15
05/31/2012	0.46	0.57	6.68	0.4
06/30/2012	0.57	0.75	5.2	0.28
07/31/2012	0.54	0.64	7.66	0.82
08/31/2012	0.46	0.62	7.17	0.32
09/30/2012	0.39	0.43	7.7	1.3
10/31/2012	0.42	0.52	7.82	0.24
11/30/2012	0.39	0.42	6.3	0.17
12/31/2012	0.4	0.45	5.79	0.15
01/31/2013	0.4	0.46	6.51	0.21
02/28/2013	0.38	0.39	6.52	0.15
03/31/2013	0.4	0.43	6.95	0.42
04/30/2013	0.43	0.47	6.58	0.33
05/31/2013	0.49	0.59	6.17	0.24
06/30/2013	0.54	0.7	2.89	0.25
07/31/2013	0.52	0.64	6.45	0.43
08/31/2013	0.45	0.59	6.64	0.17
09/30/2013	0.46	0.56	6.63	0.05
10/31/2013	0.41	0.51	8.07	0.31
11/30/2013	0.42	0.49	7.95	0.73
12/31/2013	0.42	0.5	8.14	0.14
01/31/2014	0.43	0.5	7.59	0.15
02/28/2014	0.45	0.6	7.59	0.21
03/31/2014	0.52	0.95	6.9	0.35
04/30/2014	0.42	0.62	7.14	0.12
05/31/2014	0.5	0.69	6.42	0.3
06/30/2014	0.62	0.99	5.8	0.28
07/31/2014	0.62	0.73	5.57	0.18
08/31/2014	0.5	0.66	7.81	0.35
Average	**0.415**	**0.527**	**9.540**	**0.369**
Median	**0.400**	**0.500**	**7.590**	**0.265**
90th Percentile	**0.530**	**0.700**	**12.178**	**0.795**
Summer Ave.	**0.435**	**0.550**	**12.416**	**0.346**
Population	4,688	Influent->	35.0	7.00
	88	149	78%	96%
	gpcd ave	gpcd max	removal	removal

Stevensville WWTP				MT0022713
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.63	0.665		
02/28/2010	0.58	0.62	16.7	2.7
03/31/2010	0.25			2.97
04/03/2010	0.295	0.34	16.9	2.27
05/31/2010	0.47	0.515		
06/03/2010				
07/31/2010	2.8	2.8		
08/31/2010	1.3			
09/03/2010	0.82	0.975		
01/31/2010	0.23			
11/03/2010	0.19	0.23	13.6	2.1
12/31/2010	0.425	0.87	2.1	2.74
01/31/2011	1.35	1.67		
02/28/2011	0.39	1.51		
03/31/2011	0.445	0.83	14.1	2.26
04/03/2011	0.38	0.455		
05/31/2011	0.31	0.38		
06/03/2011	0.31	0.38	5	1.42
07/31/2011	0.56		4.36	1.78
08/31/2011	0.25	0.275		
09/03/2011	0.27	0.31		
01/31/2011	0.31	0.37		
11/03/2011				
12/31/2011	0.5	0.59		
01/31/2012	0.3		19.6	4
02/29/2012	0.31	0.365		
03/31/2012	0.25		15.4	1.35
04/03/2012	0.23	0.26		
05/31/2012	0.21	0.28	18.1	3.72
06/03/2012	0.21	0.265		
07/31/2012			16.9	
08/31/2012			11.2	
09/03/2012			2.2	
01/31/2012	0.215	0.28		
11/03/2012				
12/31/2012	0.285	0.44		
01/31/2013	0.245	0.31		
02/28/2013				
03/31/2013	0.215	0.29		
04/03/2013				
05/31/2013	0.235	0.33		
06/03/2013			19	
07/31/2013	0.21	0.3	19	
08/31/2013			2.7	2.43
09/03/2013	0.245	0.32	21.31	
01/31/2013	0.215	0.28		
11/03/2013	0.24	0.29		
12/31/2013				
01/31/2014	0.21	0.26		
02/28/2014				
03/31/2014	0.37	0.94		
04/03/2014				
05/31/2014	0.25	0.29		
06/03/2014			19.4	
07/31/2014	0.23	0.31		4.55
08/31/2014				2.18
Average	**0.428**	**0.557**	**13.198**	**2.605**
Median	**0.285**	**0.340**	**16.050**	**2.350**
90th Percentile	**0.604**	**0.965**	**19.460**	**3.916**
Summer Ave.	**0.743**	**0.756**	**11.096**	**2.735**
Population	1,809	Influent->	16.7	4.56
	236	533	4%	49%
	gpcd ave	gpcd max	removal	removal

Wolf Point WWTP				MT0030571
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0	0		
02/28/2010	0	0		
03/31/2010	1.07	1.07		
04/30/2010	0	0		
05/31/2010	0	0		
06/30/2010	0	0		
07/31/2010	0	0		
08/31/2010	0	0		
09/30/2010	0	0		
10/31/2010	0	0		
11/30/2010	1.07	1.07		
12/31/2010	0	0		
01/31/2011	0	0		
02/28/2011	0	0		
03/31/2011	1.07	1.07		
04/30/2011	0	0		
05/31/2011	0	0		
06/30/2011	0	0		
07/31/2011	0	0		
08/31/2011	1.07	1.07		
09/30/2011	0	0		
10/31/2011	1.07	1.07		
11/30/2011	0	0		
12/31/2011	0	0		
01/31/2012	0	0		
02/29/2012	0	0		
03/31/2012	0	0		
04/30/2012	0	0		
05/31/2012	0	0		
06/30/2012	0	0		
07/31/2012	0	0		
08/31/2012	0	0		
09/30/2012	0	0		
10/31/2012	1.07	1.07		
11/30/2012	0	0		
12/31/2012	0	0	8	1.98
01/31/2013	0	0		
02/28/2013	0	0		
03/31/2013	0	0		
04/30/2013	1.07	1.07		
05/31/2013	0	0		
06/30/2013	1.07	1.07		
07/31/2013	0	0		
08/31/2013	0	0		
09/30/2013	0	0		
10/31/2013	0	0		
11/30/2013	1.07	1.07		
12/31/2013	0	0		
01/31/2014	0	0		
02/28/2014	0	0		
03/31/2014	0	0		
04/30/2014	1.07	1.07		
05/31/2014	0	0		
06/30/2014	0	0		
07/31/2014	0	0		
08/31/2014	0	0		
Average	**0.191**	**0.191**	**8.000**	**1.980**
Median	**0.000**	**0.000**	**8.000**	**1.980**
90th Percentile	**1.070**	**1.070**	**8.000**	**1.980**
Summer Ave.	**0.076**	**0.076**		
Population	2,621	Influent->	35.0	7.00
	73	408	77%	72%
	gpcd ave	gpcd max	removal	removal

Hysham WWTP				MT0021709
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0	0		
02/28/2010	0	0		
03/31/2010	0	0		
04/30/2010	0	0		
05/31/2010	0	0		
06/30/2010	0.01	0.09		
07/31/2010	0	0		
08/31/2010	0	0		
09/30/2010	0	0		
10/31/2010	0.01	0.1		
11/30/2010	0	0		
12/31/2010	0	0		
01/31/2011	0	0		
02/28/2011	0	0		
03/31/2011	0	0		
04/30/2011	0	0		
05/31/2011	0	0		
06/30/2011	0	0		
07/31/2011	0	0		
08/31/2011	0	0		
09/30/2011	0	0		
10/31/2011	0.01	0.14		
11/30/2011	0	0		
12/31/2011	0	0		
01/31/2012	0	0		
02/29/2012	0	0		
03/31/2012	0	0		
04/30/2012	0	0		
05/31/2012	0.04	0.14		
06/30/2012	0	0		
07/31/2012	0	0		
08/31/2012	0	0		
09/30/2012	0	0		
10/31/2012	0	0		
11/30/2012	0	0		
12/31/2012	0	0		
01/31/2013	0	0		
02/28/2013	0	0		
03/31/2013	0	0		
04/30/2013	0	0		
05/31/2013	0	0		
06/30/2013	0	0		
07/31/2013	0	0		
08/31/2013	0	0		
09/30/2013	0	0		
10/31/2013	0	0		
11/30/2013	0	0		
12/31/2013	0	0		
01/31/2014	0	0		
02/28/2014	0	0		
03/31/2014	0	0		
04/30/2014	0	0		
05/31/2014	0	0		
06/30/2014	0.03	0.17		
07/31/2014	0	0		
08/31/2014	0	0		
Average	**0.002**	**0.011**		
Median	**0.000**	**0.000**		
90th Percentile	**0.000**	**0.000**		
Summer Ave.	**0.000**	**0.000**		
Population		312		
		37		
	gpcd ave	gpcd max	removal	removal

Superior WWTP				MT0020664
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.06	0.07	38.1	7.39
02/28/2010	0.05	0.07	40.1	6.78
03/31/2010	0.05	0.10	40.2	6.24
04/30/2010	0.05	0.07	39	6.23
05/31/2010	0.05	0.06	33.5	6.02
06/30/2010	0.06	0.12	35.3	6.98
07/31/2010	0.05	0.07	20.9	5.32
08/31/2010	0.05	0.07	10.2	6.86
09/30/2010	0.06	0.09	6.11	7.22
10/31/2010	0.05	0.07	14	6.75
11/30/2010	0.06	0.07	21	6.05
12/31/2010	0.06	0.06	29.7	5.49
01/31/2011	0.06	0.09	32	5.41
02/28/2011	0.05	0.09	37.6	5.44
03/31/2011	0.06	0.07	39.1	5.75
04/30/2011	0.05	0.06	37.2	5.89
05/31/2011	0.05	0.06	37.6	5.35
06/30/2011	0.05	0.06	27.6	4.39
07/31/2011	0.03	0.03	18.3	5.26
08/31/2011	0.03	0.04	17.7	7.03
09/30/2011	0.03	0.04	4.87	7.57
10/31/2011	0.04	0.05	8.37	6.66
11/30/2011	0.03	0.05	15.8	5.49
12/31/2011	0.03	0.05	24.1	5.46
01/31/2012	0.03	0.05	30.5	5.86
02/29/2012	0.03	0.04	37	6.41
03/31/2012	0.04	0.05	38.2	6.32
04/30/2012	0.03	0.04	37.8	6.26
05/31/2012	0.03	0.05	33.3	6.31
06/30/2012	0.03	0.30	26.6	5.37
07/31/2012	0.03	0.03	14	6.08
08/31/2012	0.02	0.03	14.4	7.15
09/30/2012	0.03	0.03	13.7	7.34
10/31/2012	0.03	0.05	17.1	7.56
11/30/2012	0.03	0.05	24.2	6.09
12/31/2012	0.03	0.06	28.2	5.83
01/31/2013	0.03	0.04	35.7	6.03
02/28/2013	0.03	0.03	39.1	6.2
03/31/2013	0.03	0.03	33.2	6.36
04/30/2013	0.03	0.04	39	6.51
05/31/2013	0.03	0.05	35.5	6.09
06/30/2013	0.03	0.04	31.6	6.87
07/31/2013	0.03	0.04	14.1	6.64
08/31/2013	0.03	0.04	9.86	7.83
09/30/2013	0.03	0.35	9.95	7.37
10/31/2013	0.03	0.04	5.98	6.82
11/30/2013	0.03	0.04	10.9	6.23
12/31/2013	0.03	0.04	18.4	6.23
01/31/2014	0.03	0.05	30.5	6.79
02/28/2014	0.04	0.05	36.8	6.92
03/31/2014	0.24	0.07	37.2	6.47
04/30/2014	0.03	0.05	36.5	5.67
05/31/2014	0.02	0.03	36.2	6.6
06/30/2014	0.03	0.05	34.1	7.03
07/31/2014	0.02	0.03	17.9	5.64
08/31/2014	0.02	0.03	4.22	7.64
Average	**0.041**	**0.064**	**26.073**	**6.349**
Median	**0.031**	**0.051**	**30.100**	**6.285**
90th Percentile	**0.056**	**0.089**	**38.600**	**7.355**
Summer Ave.	**0.032**	**0.067**	**12.586**	**6.782**
Population	812	Influent->	35.0	7.00
	50	110	14%	10%
	gpcd ave	gpcd max	removal	removal

Glendive WWTP				MT0021628
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0	0		
02/28/2010	0	0		
03/31/2010	0	0		
04/30/2010	0	0		
05/31/2010	0.7	1.2	18	4.7
06/30/2010	0.25	1.1	16	4.5
07/31/2010	0	0		
08/31/2010	0	0		
09/30/2010	0	0		
10/31/2010	1.15	1.28	12	4.9
11/30/2010	0	0		
12/31/2010	0	0		
01/31/2011	0	0		
02/28/2011	0	0		
03/31/2011	0	0		
04/30/2011	1.1	1.2	21	4.2
05/31/2011	1.19	1.22	19	3.3
06/30/2011	1.24	1.29	10	3.8
07/31/2011	0	0		
08/31/2011	0	0		
09/30/2011	0	0		
10/31/2011	0	0		
11/30/2011	1.3	1.8	10.3	3.1
12/31/2011	0	0		
01/31/2012	0	0		
02/29/2012	0	0		
03/31/2012	0	0		
04/30/2012	0	0		
05/31/2012	1.2	1.37	22.1	5.1
06/30/2012	0	0		
07/31/2012	0	0		
08/31/2012	0	0		
09/30/2012	0	0		
10/31/2012	0.3	1.4	11	3.6
11/30/2012	0	0		
12/31/2012	0	0		
01/31/2013	0	0		
02/28/2013	0	0		
03/31/2013	0	0		
04/30/2013	0	0		
05/31/2013	0.78	1.2	18.2	4.3
06/30/2013	1.4	2	19.1	4.7
07/31/2013	0	0		
08/31/2013	0	0		
09/30/2013	0	0		
10/31/2013	1.2	2.6	15.1	4.8
11/30/2013	1	2	19.8	5.09
12/31/2013	0	0		
01/31/2014	0	0		
02/28/2014	0	0		
03/31/2014	0	0		
04/30/2014	0	0		
05/31/2014	0	0		
06/30/2014	0	0		
07/31/2014	0	0		
08/31/2014	0	0		
Average	**0.229**	**0.351**	**16.277**	**4.315**
Median	**0.000**	**0.000**	**18.000**	**4.500**
90th Percentile	**1.170**	**1.330**	**20.760**	**5.052**
Summer Ave.	**0.000**	**0.000**		
Population	4,935	Influent->	35.0	7.00
	46	270	49%	36%
	gpcd ave	gpcd max	removal	removal

Whitehall WWTP				MT0020133
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.09		23.5	4.54
02/28/2010	0.89		28.3	5.04
03/31/2010	0.1		23	3.56
04/30/2010	0			
05/31/2010	0			
06/30/2010	0.1		11.3	2.87
07/31/2010	0.09		9.31	0.54
08/31/2010	0.09		7.35	2.52
09/30/2010	0.09		15.7	1.94
10/31/2010	0.09		14.9	3.77
11/30/2010	0.09		18.9	2.97
12/31/2010	0.09		20.8	3.84
01/31/2011	0.09		27	4.34
02/28/2011	0.09		27.3	4.56
03/31/2011	0.1		26.1	4.08
04/30/2011	0			
05/31/2011	0.1		11.4	1.38
06/30/2011	0.1		10.3	0.18
07/31/2011	0.09		10.5	1.18
08/31/2011	0.09		8.01	1.66
09/30/2011	0			
10/31/2011	0.1		18.9	1.89
11/30/2011	0.1		17.4	2.01
12/31/2011	0.09		20.9	2.59
01/31/2012	0.09		21.5	3.33
02/29/2012	0			
03/31/2012	0			
04/30/2012	0			
05/31/2012	0.1		0.81	0.17
06/30/2012	0.09		16.3	4.44
07/31/2012	0.1		22	5.21
08/31/2012	0.1		17.1	4.17
09/30/2012	0			
10/31/2012				
11/30/2012	0			
12/31/2012	0			
01/31/2013	0			
02/28/2013	0			
03/31/2013	0			
04/30/2013	0			
05/31/2013	0			
06/30/2013	0			
07/31/2013	0			
08/31/2013	0			
09/30/2013	0			
10/31/2013	0			
11/30/2013	0			
12/31/2013	0			
01/31/2014	0			
02/28/2014	0			
03/31/2014	0			
04/30/2014	0			
05/31/2014	0			
06/30/2014	0			
07/31/2014	0			
08/31/2014	0			
Average	**0.057**		**17.143**	**2.911**
Median	**0.000**		**17.400**	**2.970**
90th Percentile	**0.100**		**26.640**	**4.552**
Summer Ave.	**0.046**		**12.853**	**2.460**
Population	1,038		35.0	7.00
	55		50%	58%
	gpcd ave	gpcd max	removal	removal

Baker WWTP				MTG580029
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0			
02/28/2010	0			
03/31/2010	0			
04/30/2010	0			
05/31/2010	0.088560567		9.2	3.5
06/30/2010	0			
07/31/2010	0			
08/31/2010	0			
09/30/2010	0			
10/31/2010	0.087840562		12.2	3.21
11/30/2010	0			
12/31/2010	0			
01/31/2011	0			
02/28/2011	0			
03/31/2011	0			
04/30/2011	0.087840562		9.7	2.84
05/31/2011	0.087840562		8.6	2.32
06/30/2011	0			
07/31/2011	0			
08/31/2011	0			
09/30/2011	0			
10/31/2011	0			
11/30/2011	0			
12/31/2011	0			
01/31/2012	0			
02/29/2012	0			
03/31/2012	0			
04/30/2012	0			
05/31/2012	0			
06/30/2012	0			
07/31/2012	0			
08/31/2012	0			
09/30/2012	0			
10/31/2012	0			
11/30/2012	0			
12/31/2012	0			
01/31/2013	0			
02/28/2013	0			
03/31/2013	0			
04/30/2013	0			
05/31/2013	0			
06/30/2013	0			
07/31/2013	0			
08/31/2013	0			
09/30/2013	0			
10/31/2013	0.1		9.55	4.34
11/30/2013	0			
12/31/2013	0			
01/31/2014	0			
02/28/2014	0			
03/31/2014	0			
04/30/2014	0.05			
05/31/2014	0.05		6.4	
06/30/2014	0			
07/31/2014	0			
08/31/2014	0			
Average	**0.010**		**7.975**	**4.340**
Median	**0.000**		**7.975**	**4.340**
90th Percentile	**0.050**		**9.235**	**4.340**
Summer Ave.	**0.000**			
Population	1,741		35.0	7.00
	6		77%	38%
	gpcd ave	gpcd max	removal	removal

Cut Bank WWTP				MT0020141
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.18		26.1	6.27
02/28/2010	0.12		33.6	6.59
03/31/2010	0			
04/30/2010	0.1		19.2	4.49
05/31/2010	0			
06/30/2010	0			
07/31/2010	0.28		11.1	4.66
08/31/2010	0.25		11.8	5.56
09/30/2010	0.28		12.8	5.88
10/31/2010	0.28		15	5.44
11/30/2010	0			
12/31/2010	0.18		13.2	2.99
01/31/2011	0			
02/28/2011	0			
03/31/2011	0.18		28.2	7.04
04/30/2011	0			
05/31/2011	0.18		23.6	4.46
06/30/2011	0			
07/31/2011	0.18		10.8	3.81
08/31/2011	0.18		17.4	5.42
09/30/2011	0			
10/31/2011	0			
11/30/2011	0.14		9.67	1.6
12/31/2011	0			
01/31/2012	0.18		12.2	2.99
02/29/2012	0.18		15.8	3.63
03/31/2012	0	0		
04/30/2012	0	0		
05/31/2012	0	0		
06/30/2012	0	0		
07/31/2012	0.15	2.43	13.9	4.17
08/31/2012	0	0		
09/30/2012	0	0		
10/31/2012	0	0		
11/30/2012	0	0		
12/31/2012	0	0		
01/31/2013	0.14	0.14	26.3	4.27
02/28/2013	0	0		
03/31/2013	0	0		
04/30/2013	0	0		
05/31/2013	0	0		
06/30/2013	0.36	0.36	14.5	4.32
07/31/2013	0	0		
08/31/2013	0	0		
09/30/2013	0	0		
10/31/2013	0.18	0.18	4.95	1.28
11/30/2013	0.12	0.12	7.62	1.93
12/31/2013	0	0		
01/31/2014	0	0		
02/28/2014	0	0		
03/31/2014	0	0		
04/30/2014	0.18	0.18	21.9	5.12
05/31/2014	0	0		
06/30/2014	0.18	0.18	9.82	3.77
07/31/2014	0	0		
08/31/2014	0	0		
Average	**0.075**	**0.120**	**16.339**	**4.350**
Median	**0.000**	**0.000**	**14.200**	**4.390**
90th Percentile	**0.180**	**0.180**	**26.280**	**6.231**
Summer Ave.	**0.094**	**0.304**	**12.967**	**4.917**
Population	2,869	Influent->	35.0	7.00
	26	63	59%	37%
	gpcd ave	gpcd max	removal	removal

Eureka WWTP				MTG580032
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.04		8.3	2.77
02/28/2010	0.05		9.23	3.02
03/31/2010	0.06		8.39	2.34
04/30/2010	0.04		11.1	3.08
05/31/2010	0.05		10	2.91
06/30/2010	0.10		10.1	3.05
07/31/2010	0			
08/31/2010	0			
09/30/2010	0			
10/31/2010	0.08		2.55	3.47
11/30/2010	0.09		2.61	2.78
12/31/2010	0.10		2.83	2.85
01/31/2011	0.11		3.28	2.68
02/28/2011	0.11		6.76	3.3
03/31/2011	0.13		7.99	3.31
04/30/2011	0.13		9.17	2.76
05/31/2011	0.12		9.58	3.03
06/30/2011	0.26		6.09	2.69
07/31/2011	0			
08/31/2011	0			
09/30/2011	0			
10/31/2011	0.13		1.55	2.63
11/30/2011	0.10		1.75	2.32
12/31/2011	0.10		2.44	2.19
01/31/2012	0.10		4.17	2.8
02/29/2012	0.11		5.82	2.61
03/31/2012	0.12		9.3	2.98
04/30/2012	0.12		9.96	2.7
05/31/2012	0.12		9.75	2.61
06/30/2012	0.24		10.2	2.74
07/31/2012	0			
08/31/2012	0			
09/30/2012	0			
10/31/2012	0.10		4	2.41
11/30/2012	0.08		3.51	2.12
12/31/2012	0.07		4.72	2.23
01/31/2013	0.06	0.08		
02/28/2013	0.06	0.09		
03/31/2013	0.06	0.09		
04/30/2013	0.05	0.07		
05/31/2013	0.06	0.2	10.7	2.46
06/30/2013	0.06	0.12	7.29	2.39
07/31/2013	0.04	0.09	5.92	2.58
08/31/2013	0.11	0.19	4.15	2.16
09/30/2013	0.04	0.12	2.39	2.55
10/31/2013	0	0		
11/30/2013	0.06	0.16		
12/31/2013	0	0		
01/31/2014	0.07	0.15		
02/28/2014	0.1	0.11		
03/31/2014	0.11	0.19		
04/30/2014	0.11	0.19		
05/31/2014	0.07	0.18	7.92	2.14
06/30/2014	0.09	0.15	8.42	2.94
07/31/2014	0.09	0.21	7.37	3.6
08/31/2014	0.11	0.18	3.84	3.49
Average	**0.075**	**0.129**	**6.476**	**2.741**
Median	**0.074**	**0.135**	**7.025**	**2.720**
90th Percentile	**0.121**	**0.191**	**10.050**	**3.305**
Summer Ave.	**0.028**	**0.158**	**4.734**	**2.876**
Population	1,037	Influent->	35.0	7.00
	72	184	80%	61%
	gpcd ave	gpcd max	removal	removal

Shelby WWTP				MT0031488
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0			
02/28/2010	0			
03/31/2010	0			
04/30/2010	0.05			
05/31/2010	0.3			
06/30/2010	0.29		9.7	1.1
07/31/2010	0.3			
08/31/2010	0.22			
09/30/2010	0.18		4.2	1.14
10/31/2010	0.17			
11/30/2010	0.2			
12/31/2010	0.19		6.8	1
01/31/2011	0			
02/28/2011	0			
03/31/2011	0			
04/30/2011	0			
05/31/2011	0.3			
06/30/2011	0.38		8.9	1.93
07/31/2011	0.23			
08/31/2011	0.14			
09/30/2011	0.14		1.31	1.31
10/31/2011	0.27			
11/30/2011	0.16			
12/31/2011	0.22			
01/31/2012	0			
02/29/2012	0			
03/31/2012	0			
04/30/2012	0			
05/31/2012	0.39			
06/30/2012	0.27		14.8	4.26
07/31/2012	0.27			
08/31/2012	0.22			
09/30/2012	0.12		3	0.9
10/31/2012	0.18			
11/30/2012	0.19			
12/31/2012	0.37		10.4	2.1
01/31/2013	0			
02/28/2013	0			
03/31/2013	0			
04/30/2013	0			
05/31/2013	0.07			
06/30/2013	0.46		11.2	2.5
07/31/2013	0.34			
08/31/2013	0.26			
09/30/2013	0.14		2.2	1.25
10/31/2013	0.18			
11/30/2013	0.05			
12/31/2013	0.12		7.8	
01/31/2014	0			
02/28/2014	0			
03/31/2014	0			
04/30/2014	0			
05/31/2014	0.31	0.56		
06/30/2014	0.37	0.55	18	4.41
07/31/2014	0.12	0.12		
08/31/2014	0.15	0.15	4.9	2.49
Average	**0.149**	**0.345**	**7.939**	**2.033**
Median	**0.145**	**0.350**	**7.800**	**1.620**
90th Percentile	**0.325**	**0.557**	**14.080**	**4.084**
Summer Ave.	**0.202**	**0.135**	**3.122**	**1.418**
Population	3,376	Influent->	35.0	7.00
	44	165	78%	77%
	gpcd ave	gpcd max	removal	removal

Choteau WWTP				MT0020052
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.49	0.6		
02/28/2010	0.84	0.94		
03/31/2010	0.89	0.94	10.8	2.02
04/30/2010	0.69	1.15		
05/31/2010	0.63	0.8		
06/30/2010	0.69	0.76	2	0.21
07/31/2010	0.63	0.94		
08/31/2010	0.29	0.72		
09/30/2010	0.27	0.33	7.97	0.02
10/31/2010	0.07	0.33		
11/30/2010	0.16	0.36		
12/31/2010	0.25	0.35		
01/31/2011	0.35	0.39		
02/28/2011	0.44	0.5		
03/31/2011	0.28	0.55	8.3	1.73
04/30/2011	0.7	0.78		
05/31/2011	0.66	0.81		
06/30/2011	1.19	1.73	7.2	0.9
07/31/2011	0.8	0.94		
08/31/2011	0.53	0.86		
09/30/2011	0.36	0.65	1.7	0.51
10/31/2011	0.49	0.91		
11/30/2011	0.73	0.79		
12/31/2011	0.23	0.79	7.7	1.45
01/31/2012	0.34	0.65		
02/29/2012	0.58	0.6		
03/31/2012	0.51	0.58	9.09	0.91
04/30/2012	0.52	0.58		
05/31/2012	0.5	1.01		
06/30/2012	0.29	1.01	4.65	0.21
07/31/2012	0.49	0.97		
08/31/2012	0.37	0.97		
09/30/2012			16	2.7
10/31/2012	0.09	0.46		
11/30/2012	0.5	0.58		
12/31/2012	0.48	0.58	11.5	1.08
01/31/2013	0.53	0.67		
02/28/2013	0.56	0.59		
03/31/2013	0.35	0.99	12.13	2.4
04/30/2013	0.17	0.43		
05/31/2013	0.41	0.86		
06/30/2013	0.26	0.78	5.08	0.58
07/31/2013	0.4	0.91		
08/31/2013	0.33	0.86		
09/30/2013			2.45	1.95
10/31/2013	0.46	0.89		
11/30/2013	0.31	0.33		
12/31/2013	0.32	0.34	3.59	0.93
01/31/2014	0.34	0.36		
02/28/2014	0.3	0.38		
03/31/2014				
04/30/2014	0.52	0.65		
05/31/2014	0.62	0.86		
06/30/2014	0.22	0.58	9.67	1.82
07/31/2014	0.71	0.86		
08/31/2014	0.54	0.54		
Average	**0.466**	**0.713**	**7.489**	**1.214**
Median	**0.480**	**0.720**	**7.835**	**1.005**
90th Percentile	**0.708**	**0.970**	**11.815**	**2.210**
Summer Ave.	**0.477**	**0.796**	**7.030**	**1.295**
Population	1,684	Influent->	14.3	3.90
	277	576	45%	74%
	gpcd ave	gpcd max	removal	removal

Glasgow WWTP				MT0021211
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0.34	0.34		
02/28/2010	0.34	0.34		
03/31/2010	0.35	0.35	31	3.4
04/30/2010	0.34	0.34		
05/31/2010	0.42	0.42		
06/30/2010	0.49	0.49	24	3.5
07/31/2010	0.43	0.43		
08/31/2010	0.56	0.56		
09/30/2010	0.44	0.44	25	2.4
10/31/2010	0.38	0.38		
11/30/2010	0.44	0.44		
12/31/2010	0.44	0.44	25	2.68
01/31/2011	0.46	0.46		
02/28/2011	0.47	0.47		
03/31/2011	0.46	0.46	20	2.1
04/30/2011	0.63	0.63		
05/31/2011	0.91	0.91		
06/30/2011	0.53	0.53	14.8	0.43
07/31/2011	0.63	0.63		
08/31/2011	0.44	0.44		
09/30/2011	0.38	0.38	18.4	1.28
10/31/2011	0.38	0.38		
11/30/2011	0.35	0.35		
12/31/2011	0.32	0.32	25	2.26
01/31/2012	0.37	0.37		
02/29/2012	0.28	0.28		
03/31/2012	0.38	0.38	26	2.76
04/30/2012	0.4	0.4		
05/31/2012	0.39	0.39		
06/30/2012	0.36	0.36	21	2.1
07/31/2012	0.37	0.37		
08/31/2012	0.43	0.43		
09/30/2012	0.38	0.38	13	1.5
10/31/2012	0.36	0.36		
11/30/2012	0.44	0.44		
12/31/2012	0.38	0.38	19.7	2.15
01/31/2013	0.39	0.39		
02/28/2013	0.4	0.4		
03/31/2013	0.34	0.34	25	2.36
04/30/2013	0.38	0.38		
05/31/2013	0.42	0.42		
06/30/2013	0.72	0.72	14.2	0.93
07/31/2013	0.47	0.47		
08/31/2013	0.42	0.42		
09/30/2013	0.44	0.76	20.9	1.94
10/31/2013	0.39	0.6		
11/30/2013	0.37	0.39		
12/31/2013	0.34	0.38		
01/31/2014	0.34	0.45		
02/28/2014	0.32	0.35		
03/31/2014	0.34	0.4		
04/30/2014	0.33	0.42		
05/31/2014	0.37	0.42		
06/30/2014	0.4	0.45	20	3.24
07/31/2014	0.4	0.47	10.2	2.85
08/31/2014	0.58	1.92	28.7	3
Average	**0.422**	**0.465**	**21.217**	**2.271**
Median	**0.390**	**0.420**	**20.950**	**2.310**
90th Percentile	**0.545**	**0.615**	**26.810**	**3.288**
Summer Ave.	**0.455**	**0.579**	**19.367**	**2.162**
Population	3,250	Influent->	30.5	7.00
	130	189	31%	67%
	gpcd ave	gpcd max	removal	removal

Plentywood WWTP				MTG580008
	Flow	Flow	Effluent	Effluent
	Monthly	Daily	TN	TP
Date	Ave	Max	(mg/l)	(mg/l)
01/31/2010	0			
02/28/2010	0			
03/31/2010	0			
04/30/2010	0			
05/31/2010	0.22			
06/30/2010	0			
07/31/2010	0			
08/31/2010	0			
09/30/2010	0			
10/31/2010	0			
11/30/2010	0.22			
12/31/2010	0			
01/31/2011	0			
02/28/2011	0			
03/31/2011	0			
04/30/2011	0			
05/31/2011	0.22			
06/30/2011				
07/31/2011	0			
08/31/2011	0			
09/30/2011	0			
10/31/2011	0			
11/30/2011	0.21			
12/31/2011	0			
01/31/2012	0			
02/29/2012	0			
03/31/2012	0			
04/30/2012	0			
05/31/2012	0			
06/30/2012	0.21			
07/31/2012	0			
08/31/2012	0			
09/30/2012	0			
10/31/2012	0			
11/30/2012	0.22			
12/31/2012	0			
01/31/2013	0			
02/28/2013	0			
03/31/2013	0			
04/30/2013	0			
05/31/2013	0			
06/30/2013	0			
07/31/2013	0			
08/31/2013	0			
09/30/2013	0			
10/31/2013		0.22	9.7	3.22
11/30/2013	0			
12/31/2013	0			
01/31/2014	0			
02/28/2014	0			
03/31/2014	0			
04/30/2014	0			
05/31/2014	0			
06/30/2014		0.22	5.4	1.19
07/31/2014	0			
08/31/2014	0			
Average	**0.024**	**0.220**	**7.550**	**2.205**
Median	**0.000**	**0.220**	**7.550**	**2.205**
90th Percentile	**0.165**	**0.220**	**9.270**	**3.017**
Summer Ave.				
Population	1,734	Influent->	35.0	7.00
	14	127	78%	69%
	gpcd ave	gpcd max	removal	removal

APPENDIX B

SEASONAL DEMAND AND COST CALCULATIONS
FOR TOTAL NITROGEN AND TOTAL PHOSPHOROUS
FOR EACH DISCHARGER AND EACH PERMIT CYCLE (4 CYCLES)

STILLWATER MINING COMPANY - EAST BOULDER										Demand Calculations
Total Nitrogen										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	2/1/2015	15	3.3	0.23	-22	0	0	$0	$0	$0
2	2/1/2020	12	3.3	0.23	-17	0	0	$0	$0	$0
3	2/1/2025	10	3.3	0.24	-13	0	0	$0	$0	$0
4	2/1/2030	8	3.3	0.24	-10	0	0	$0	$0	$0
*Incremental Demand / Assuming season is 90 days										
Total Phosphorous										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	2/1/2015	2	5.1	0.23	6	535	535	$163,132	$1,529	$185,267
2	2/1/2020	2	5.1	0.23	6	11	546	$166,395	$1,560	$188,972
3	2/1/2025	1	5.1	0.24	8	191	736	$224,472	$2,104	$254,930
4	2/1/2030	0.8	5.1	0.24	9	51	788	$285,870	$3,288	$333,450
*Incremental Demand / Assuming season is 90 days										

WESTERN SUGAR COOPERATIVE									Demand Calculations
Settling Ponds (One Pond with Aeration)									
Total Nitrogen									
							NPV Costs based on 20 Years at 3.3%		
Permit	**Date**	**Variance Limit (mg/l)**	**Current Discharge (mg/l)**	**Flow (mgd)**	**Demand (lbs/day)**	**Seasonal Demand (lbs)***	**Cumulative Demand (lbs)**	**Captial Cost to Upgrade**	**O&M Cost to Upgrade**	**NPV Cost to Upgrade**
1	1/1/2015	15	13.4	0.73	-10	0	0	$0	$0	$0
2	1/1/2020	12	13.4	0.74	9	1,174	1,174	$243,175	$2,189	$274,850
3	1/1/2025	10	13.4	0.76	22	1,734	2,907	$597,035	$5,373	$674,803
4	1/1/2030	8	13.4	0.77	35	1,803	4,710	$1,265,373	$14,379	$1,473,484
*Incremental Demand / Assuming season is 90 days										
Total Phosphorous										
							NPV Costs based on 20 Years at 3.3%			
Permit	**Date**	**Variance Limit (mg/l)**	**Current Discharge (mg/l)**	**Flow (mgd)**	**Demand (lbs/day)**	**Seasonal Demand (lbs)***	**Cumulative Demand (lbs)**	**Captial Cost to Upgrade**	**O&M Cost to Upgrade**	**NPV Cost to Upgrade**
1	1/1/2015	2	0.2	0.73	-11	0	0	$0	$0	$0
2	1/1/2020	2	0.2	0.74	-11	0	0	$0	$0	$0
3	1/1/2025	1	0.2	0.76	-5	0	0	$0	$0	$0
4	1/1/2030	0.8	0.2	0.77	-4	0	0	$0	$0	$0
*Incremental Demand / Assuming season is 90 days										

ELKHORN HEALTH CARE WWTP									Demand Calculations
Extended Aeration Package Plant with Polishing Pond									
Total Nitrogen									
							NPV Costs based on 20 Years at 3.3%		
Permit	**Date**	**Variance Limit (mg/l)**	**Current Discharge (mg/l)**	**Flow (mgd)**	**Demand (lbs/day)**	**Seasonal Demand (lbs)***	**Cumulative Demand (lbs)**	**Captial Cost to Upgrade**	**O&M Cost to Upgrade**	**NPV Cost to Upgrade**
1	2/1/2015	15	21.3	0.004	0.21	28	28	$61,760	$556	$69,805
2	2/1/2020	12	21.3	0.004	0.32	14	43	$92,168	$830	$104,173
3	2/1/2025	10	21.3	0.004	0.39	10	53	$113,215	$1,019	$127,962
4	2/1/2030	8	21.3	0.004	0.47	11	64	$177,820	$2,021	$207,066
*Incremental Demand / Assuming season is 90 days										
Total Phosphorous										
								NPV Costs based on 20 Years at 3.3%		
Permit	**Date**	**Variance Limit (mg/l)**	**Current Discharge (mg/l)**	**Flow (mgd)**	**Demand (lbs/day)**	**Seasonal Demand (lbs)***	**Cumulative Demand (lbs)**	**Captial Cost to Upgrade**	**O&M Cost to Upgrade**	**NPV Cost to Upgrade**
1	2/1/2015	2	2.7	0.004	0.02	2	2	$641	$6	$728
2	2/1/2020	2	2.7	0.004	0.02	0	2	$653	$6	$742
3	2/1/2025	1	2.7	0.004	0.06	3	5	$1,619	$15	$1,838
4	2/1/2030	0.8	2.7	0.004	0.07	1	6	$2,197	$25	$2,562
*Incremental Demand / Assuming season is 90 days										

MISSOULA										Demand Calculations
4 Stage Bardenpho with Bio-P										
Total Nitrogen										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	3/1/2015	10	9.3	7.06	-41	0	0	$0	$0	$0
2	3/1/2020	8	9.3	7.20	78	10,540	10,540	$1,038,300	$11,799	$1,209,066
3	3/1/2025	8	9.3	7.35	80	211	10,751	$1,049,670	$11,928	$1,222,306
4	3/1/2030	6	9.3	7.49	206	17,086	27,837	$2,856,983	$38,773	$3,418,153
*Incremental Demand / Assuming season is 90 days										
Total Phosphorous										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	3/1/2015	1	0.47	7.06	-31	0	0	$0	$0	$0
2	3/1/2020	0.8	0.47	7.20	-20	0	0	$0	$0	$0
3	3/1/2025	0.5	0.47	7.35	-2	0	0	$0	$0	$0
4	3/1/2030	0.3	0.47	7.49	11	956	956	$107,544	$2,559	$144,574
*Incremental Demand / Assuming season is 90 days										

EAST HELENA										Demand Calculations
Biolac Extended Aeration Activated Sludge										
Total Nitrogen										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	3/1/2015	15	14.8	0.37	-1	0	0	$0	$0	$0
2	3/1/2020	12	14.8	0.38	9	1,190	1,190	$334,682	$3,012	$378,277
3	3/1/2025	10	14.8	0.38	15	891	2,080	$580,023	$5,220	$655,575
4	3/1/2030	8	14.8	0.39	22	926	3,006	$1,096,521	$12,460	$1,276,862
*Incremental Demand / Assuming season is 90 days										
Total Phosphorous										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	3/1/2015	2	2.5	0.37	2	139	139	$42,327	$397	$48,071
2	3/1/2020	2	2.5	0.38	2	3	142	$43,174	$405	$49,032
3	3/1/2025	1	2.5	0.38	5	292	433	$132,113	$1,239	$150,038
4	3/1/2030	0.8	2.5	0.39	6	68	501	$181,812	$2,091	$212,073
*Incremental Demand / Assuming season is 90 days										

DILLON										Demand Calculations
Biolac Extended Aeration										
Total Nitrogen										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	3/1/2015	15	32	0.36	51	6,910	6,910	$1,982,945	$17,847	$2,241,239
2	3/1/2020	12	32	0.37	61	1,382	8,292	$2,358,424	$21,226	$2,665,627
3	3/1/2025	10	32	0.38	69	1,012	9,303	$2,622,676	$23,604	$2,964,300
4	3/1/2030	8	32	0.38	77	1,049	10,352	$3,818,012	$43,386	$4,445,948
*Incremental Demand / Assuming season is 90 days										
Total Phosphorous										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	3/1/2015	2	4.9	0.36	9	786	786	$239,528	$2,246	$272,028
2	3/1/2020	2	4.9	0.37	9	16	802	$244,318	$2,290	$277,469
3	3/1/2025	1	4.9	0.38	12	298	1,099	$335,138	$3,142	$380,611
4	3/1/2030	0.8	4.9	0.38	13	79	1,179	$427,822	$4,920	$499,029
*Incremental Demand / Assuming season is 90 days										

KALISPELL										Demand Calculations
University of Capetown Process										
Total Nitrogen										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	6/1/2015	10	8.1	2.70	-43	0	0	$0	$0	$0
2	6/1/2020	8	8.1	2.75	2	310	310	$11,412	$214	$14,509
3	6/1/2025	8	8.1	2.81	2	6	316	$11,537	$216	$14,668
4	6/1/2030	6	8.1	2.87	50	6,458	6,775	$306,163	$7,654	$416,941
*Incremental Demand / Assuming season is 90 days										
Total Phosphorous										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	6/1/2015	1	0.12	2.70	-20	0	0	$0	$0	$0
2	6/1/2020	0.8	0.12	2.75	-16	0	0	$0	$0	$0
3	6/1/2025	0.5	0.12	2.81	-9	0	0	$0	$0	$0
4	6/1/2030	0.3	0.12	2.87	-4	0	0	$0	$0	$0
*Incremental Demand / Assuming season is 90 days										

LAUREL										Demand Calculations
Activated Sludge Rotating Biological Contactors (RBCs) - Currently being upgraded										
Total Nitrogen										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	8/1/2015	15	8	0.94	-55	0	0	$0	$0	$0
2	8/1/2020	12	8	0.96	-32	0	0	$0	$0	$0
3	8/1/2025	10	8	0.98	-16	0	0	$0	$0	$0
4	8/1/2030	8	8	1.00	0	0	0	$0	$0	$0
*Incremental Demand / Assuming season is 90 days										
Total Phosphorous										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	8/1/2015	2	3	0.94	8	706	706	$215,069	$2,016	$244,251
2	8/1/2020	2	3	0.96	8	14	720	$219,371	$2,057	$249,136
3	8/1/2025	1	3	0.98	16	748	1,468	$447,517	$4,195	$508,238
4	8/1/2030	0.8	3	1.00	18	179	1,647	$597,754	$6,874	$697,245
*Incremental Demand / Assuming season is 90 days										

BIGFORK										Demand Calculations
Membrane Bioreactor (MLE process with chemical P removal using alum)										
Total Nitrogen										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	8/1/2015	15	13.6	0.22	-3	0	0	$0	$0	$0
2	8/1/2020	12	13.6	0.22	3	404	404	$143,686	$1,293	$162,403
3	8/1/2025	10	13.6	0.23	7	523	928	$326,835	$2,942	$369,407
4	8/1/2030	8	13.6	0.23	11	544	1,472	$678,450	$7,710	$790,032
*Incremental Demand / Assuming season is 90 days										
Total Phosphorous										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	8/1/2015	2	0.3	0.22	-3	0	0	$0	$0	$0
2	8/1/2020	2	0.3	0.22	-3	0	0	$0	$0	$0
3	8/1/2025	1	0.3	0.23	-1	0	0	$0	$0	$0
4	8/1/2030	0.8	0.3	0.23	-1	0	0	$0	$0	$0
*Incremental Demand / Assuming season is 90 days										

MANHATTAN										Demand Calculations
Biowheel Extended Aeration										
Total Nitrogen										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	9/1/2015	15	10.5	0.13	-5	0	0	$0	$0	$0
2	9/1/2020	12	10.5	0.13	-2	0	0	$0	$0	$0
3	9/1/2025	10	10.5	0.14	1	77	77	$0	$0	$0
4	9/1/2030	8	10.5	0.14	3	317	394	$55,441	$1,040	$70,486
*Incremental Demand / Assuming season is 90 days										
Total Phosphorous										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	9/1/2015	2	1.1	0.13	-1	0	0	$0	$0	$0
2	9/1/2020	2	1.1	0.13	-1	0	0	$0	$0	$0
3	9/1/2025	1	1.1	0.14	0	10	10	$0	$0	$0
4	9/1/2030	0.8	1.1	0.14	0	21	32	$1,831	$41	$2,432
*Incremental Demand / Assuming season is 90 days										

GREAT FALLS										Demand Calculations
Primary plus Secondary MLE Process - construction almost finished										
Total Nitrogen										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)**	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	12/1/2015	10	8	10.00	-167	0	0	$0	$0	$0
2	12/1/2020	8	8	10.20	0	0	0	$0	$0	$0
3	12/1/2025	8	8	10.40	0	0	0	$0	$0	$0
4	12/1/2030	6	8	10.61	177	23,896	23,896	$599,119	$14,978	$815,896
*Incremental Demand / Assuming season is 90 days										
**TN Discharge based on recent upgrade design instead of historical DMR data										
Total Phosphorous										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	12/1/2015	1	2.3	10.00	108	9,758	9,758	$2,974,365	$27,885	$3,377,942
2	12/1/2020	0.8	2.3	10.20	128	1,726	11,484	$4,167,379	$47,925	$4,860,999
3	12/1/2025	0.5	2.3	10.40	156	2,572	14,057	$5,100,872	$58,660	$5,949,863
4	12/1/2030	0.3	2.3	10.61	177	1,874	15,931	$6,648,137	$88,160	$7,924,084
*Incremental Demand / Assuming season is 90 days										

MILES CITY									Demand Calculations
Extended Aeration with two oxidation ditches									
Total Nitrogen									
							NPV Costs based on 20 Years at 3.3%		
Permit	**Date**	**Variance Limit (mg/l)**	**Current Discharge (mg/l)**	**Flow (mgd)**	**Demand (lbs/day)**	**Seasonal Demand (lbs)***	**Cumulative Demand (lbs)**	**Captial Cost to Upgrade**	**O&M Cost to Upgrade**	**NPV Cost to Upgrade**
1	4/1/2016	10	23.7	1.13	129	17,430	17,430	$2,993,275	$26,939	$3,383,172
2	4/1/2021	8	23.7	1.15	151	2,944	20,374	$4,577,514	$52,017	$5,330,363
3	4/1/2026	8	23.7	1.18	154	407	20,782	$4,627,642	$52,587	$5,388,736
4	4/1/2031	6	23.7	1.20	177	3,116	23,897	$5,274,284	$59,935	$6,141,728
*Incremental Demand / Assuming season is 90 days										
Total Phosphorous										
							NPV Costs based on 20 Years at 3.3%			
Permit	**Date**	**Variance Limit (mg/l)**	**Current Discharge (mg/l)**	**Flow (mgd)**	**Demand (lbs/day)**	**Seasonal Demand (lbs)***	**Cumulative Demand (lbs)**	**Captial Cost to Upgrade**	**O&M Cost to Upgrade**	**NPV Cost to Upgrade**
1	4/1/2016	1	2.5	1.13	14	1,272	1,272	$387,811	$3,636	$440,432
2	4/1/2021	0.8	2.5	1.15	16	198	1,471	$533,702	$6,138	$622,532
3	4/1/2026	0.5	2.5	1.18	20	294	1,765	$640,443	$7,365	$747,038
4	4/1/2031	0.3	2.5	1.20	22	215	1,980	$718,577	$8,264	$838,177
*Incremental Demand / Assuming season is 90 days										

HAVRE										Demand Calculations
Activated Sludge Plant with upgrade design almost finished										
Total Nitrogen										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	5/1/2016	10	8	1.55	-26	0	0	$0	$0	$0
2	5/1/2021	8	8	1.58	0	0	0	$0	$0	$0
3	5/1/2026	8	8	1.61	0	0	0	$0	$0	$0
4	5/1/2031	6	8	1.64	27	3,704	3,704	$709,103	$8,058	$825,727
*Incremental Demand / Assuming season is 90 days										
Total Phosphorous										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	5/1/2016	1	1.9	1.55	12	1,047	1,047	$319,172	$2,992	$362,479
2	5/1/2021	0.8	1.9	1.58	15	258	1,305	$473,692	$5,447	$552,534
3	5/1/2026	0.5	1.9	1.61	19	389	1,695	$614,938	$7,072	$717,289
4	5/1/2031	0.3	1.9	1.64	22	281	1,975	$716,843	$8,244	$836,154
*Incremental Demand / Assuming season is 90 days										

HAMILTON									Demand Calculations
Oxidation Ditch Extended Aeration Plant with Anoxic Selector									
Total Nitrogen									
							NPV Costs based on 20 Years at 3.3%		
Permit	**Date**	**Variance Limit (mg/l)**	**Current Discharge (mg/l)**	**Flow (mgd)**	**Demand (lbs/day)**	**Seasonal Demand (lbs)***	**Cumulative Demand (lbs)**	**Captial Cost to Upgrade**	**O&M Cost to Upgrade**	**NPV Cost to Upgrade**
1	9/1/2016	15	5	0.64	-54	0	0	$0	$0	$0
2	9/1/2021	12	5	0.65	-38	0	0	$0	$0	$0
3	9/1/2026	10	5	0.67	-28	0	0	$0	$0	$0
4	9/1/2031	8	5	0.68	-17	0	0	$0	$0	$0
*Incremental Demand / Assuming season is 90 days										
Total Phosphorous										
							NPV Costs based on 20 Years at 3.3%			
Permit	**Date**	**Variance Limit (mg/l)**	**Current Discharge (mg/l)**	**Flow (mgd)**	**Demand (lbs/day)**	**Seasonal Demand (lbs)***	**Cumulative Demand (lbs)**	**Captial Cost to Upgrade**	**O&M Cost to Upgrade**	**NPV Cost to Upgrade**
1	9/1/2016	2	4.6	0.64	14	1,253	1,253	$381,908	$3,580	$433,728
2	9/1/2021	2	4.6	0.65	14	25	1,278	$389,547	$3,652	$442,402
3	9/1/2026	1	4.6	0.67	20	527	1,805	$550,160	$5,158	$624,808
4	9/1/2031	0.8	4.6	0.68	22	138	1,943	$705,165	$8,109	$822,533
*Incremental Demand / Assuming season is 90 days										

CONRAD									Demand Calculations
Activated Sludge with Lined Earthen Basins									
Total Nitrogen									
							NPV Costs based on 20 Years at 3.3%		
Permit	**Date**	**Variance Limit (mg/l)**	**Current Discharge (mg/l)**	**Flow (mgd)**	**Demand (lbs/day)**	**Seasonal Demand (lbs)***	**Cumulative Demand (lbs)**	**Captial Cost to Upgrade**	**O&M Cost to Upgrade**	**NPV Cost to Upgrade**
1	2/1/2017	15	14.2	0.23	-2	0	0	$0	$0	$0
2	2/1/2022	12	14.2	0.23	4	576	576	$201,488	$1,813	$227,734
3	2/1/2027	10	14.2	0.24	8	546	1,122	$388,872	$3,500	$439,525
4	9/1/2031	8	14.2	0.24	13	567	1,689	$766,043	$8,705	$892,031

*Incremental Demand / Assuming season is 90 days

Total Phosphorous										
								NPV Costs based on 20 Years at 3.3%		
Permit	**Date**	**Variance Limit (mg/l)**	**Current Discharge (mg/l)**	**Flow (mgd)**	**Demand (lbs/day)**	**Seasonal Demand (lbs)***	**Cumulative Demand (lbs)**	**Captial Cost to Upgrade**	**O&M Cost to Upgrade**	**NPV Cost to Upgrade**
1	2/1/2017	2	3.2	0.23	2	205	205	$62,599	$587	$71,093
2	2/1/2022	2	3.2	0.23	2	4	209	$63,851	$599	$72,515
3	2/1/2027	1	3.2	0.24	4	182	392	$119,401	$1,119	$135,602
4	2/1/2032	0.8	3.2	0.24	5	44	436	$158,168	$1,819	$184,493

*Incremental Demand / Assuming season is 90 days

BUTTE										Demand Calculations	
4 stage MBR with chemical addition for phosphorus removal (under construction)											
Total Nitrogen											4
								NPV Costs based on 20 Years at 3.3%			
Permit	**Date**	**Variance Limit (mg/l)**	**Current Discharge (mg/l)****	**Flow (mgd)**	**Demand (lbs/day)**	**Seasonal Demand (lbs)***	**Cumulative Demand (lbs)**	**Captial Cost to Upgrade**	**O&M Cost to Upgrade**	**NPV Cost to Upgrade**	
1	4/1/2017	10	3	3.78	-221	0	0	$0	$0	$0	2
2	4/1/2022	8	3	3.86	-161	0	0	$0	$0	$0	3
3	4/1/2027	8	3	3.94	-164	0	0	$0	$0	$0	3
4	4/1/2032	6	3	4.02	-100	0	0	$0	$0	$0	4
*Incremental Demand / Assuming season is 90 days											
**TN Discharge based on recent upgrade design instead of historical DMR data											
Total Phosphorous											4
								NPV Costs based on 20 Years at 3.3%			
Permit	**Date**	**Variance Limit (mg/l)**	**Current Discharge (mg/l)****	**Flow (mgd)**	**Demand (lbs/day)**	**Seasonal Demand (lbs)***	**Cumulative Demand (lbs)**	**Captial Cost to Upgrade**	**O&M Cost to Upgrade**	**NPV Cost to Upgrade**	
1	4/1/2017	1	0.3	3.78	-22	0	0	$0	$0	$0	2
2	4/1/2022	0.8	0.3	3.86	-16	0	0	$0	$0	$0	3
3	4/1/2027	0.5	0.3	3.94	-7	0	0	$0	$0	$0	3
4	4/1/2032	0.3	0.3	4.02	0	0	0	$0	$0	$0	4
*Incremental Demand / Assuming season is 90 days											
**TP Discharge based on recent upgrade design instead of historical DMR data											

BOZEMAN										Demand Calculations
Primary Tratment plus 5-Stage Bardenpho Secondary Treatment										
Total Nitrogen										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	6/1/2017	10	6.6	5.55	-157	0	0	$0	$0	$0
2	6/1/2022	8	6.6	5.66	-66	0	0	$0	$0	$0
3	6/1/2027	8	6.6	5.77	-67	0	0	$0	$0	$0
4	6/1/2032	6	6.6	5.89	29	3,976	3,976	$129,964	$3,249	$176,989
*Incremental Demand / Assuming season is 90 days										
Total Phosphorous										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	6/1/2017	1	1.1	5.55	5	416	416	$0	$0	$0
2	6/1/2022	0.8	1.1	5.66	14	858	1,274	$73,959	$1,676	$98,211
3	6/1/2027	0.5	1.1	5.77	29	1,325	2,599	$150,877	$3,418	$200,350
4	6/1/2032	0.3	1.1	5.89	39	935	3,534	$397,561	$9,458	$534,449
*Incremental Demand / Assuming season is 90 days										

MT BEHAVIORAL HEALTH INC WWTP										Demand Calculations
Activated Sludge Plant										
Total Nitrogen										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	8/1/2017	15	29	0.0040	0.47	63	63	$137,244	$1,235	$155,121
2	8/1/2022	12	29	0.0041	0.58	15	78	$168,479	$1,516	$190,424
3	8/1/2027	10	29	0.0042	0.66	11	89	$190,362	$1,713	$215,158
4	8/1/2032	8	29	0.0042	0.74	11	100	$280,769	$3,191	$326,946
*Incremental Demand / Assuming season is 90 days										
Total Phosphorous										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	8/1/2017	2	5.7	0.0040	0.12	11	11	$3,386	$32	$3,846
2	8/1/2022	2	5.7	0.0041	0.13	0	11	$3,454	$32	$3,923
3	8/1/2027	1	5.7	0.0042	0.16	3	15	$4,475	$42	$5,082
4	8/1/2032	0.8	5.7	0.0042	0.17	1	16	$5,665	$65	$6,608
*Incremental Demand / Assuming season is 90 days										

LEWISTOWN									Demand Calculations
Two Oxidation Ditches with Selector Zone									
Total Nitrogen									
							NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	9/1/2017	10	2.6	1.8800	-116.03	0	0	$0	$0	$0
2	9/1/2022	8	2.6	1.9176	-86.36	0	0	$0	$0	$0
3	9/1/2027	8	2.6	1.9560	-88.09	0	0	$0	$0	$0
4	9/1/2032	6	2.6	1.9951	-56.57	0	0	$0	$0	$0
*Incremental Demand / Assuming season is 90 days										
Total Phosphorous										
							NPV Costs based on 20 Years at 3.3%			
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	9/1/2017	1	0.5	1.8800	-7.84	0	0	$0	$0	$0
2	9/1/2022	0.8	0.5	1.9176	-4.80	0	0	$0	$0	$0
3	9/1/2027	0.5	0.5	1.9560	0.00	0	0	$0	$0	$0
4	9/1/2032	0.3	0.5	1.9951	3.33	300	300	$17,389	$394	$23,091
*Incremental Demand / Assuming season is 90 days										

HELENA									Demand Calculations
Primary plus Secondary Activated Sludge with MLE Process									
Total Nitrogen									
							NPV Costs based on 20 Years at 3.3%		
Permit	**Date**	**Variance Limit (mg/l)**	**Current Discharge (mg/l)**	**Flow (mgd)**	**Demand (lbs/day)**	**Seasonal Demand (lbs)***	**Cumulative Demand (lbs)**	**Captial Cost to Upgrade**	**O&M Cost to Upgrade**	**NPV Cost to Upgrade**
1	10/1/2017	10	6.5	3.0600	-89.32	0	0	$0	$0	$0
2	10/1/2022	8	6.5	3.1212	-39.05	0	0	$0	$0	$0
3	10/1/2027	8	6.5	3.1836	-39.83	0	0	$0	$0	$0
4	10/1/2032	6	6.5	3.2473	13.54	1,828	1,828	$78,091	$1,952	$106,346
*Incremental Demand / Assuming season is 90 days										
Total Phosphorous										
								NPV Costs based on 20 Years at 3.3%		
Permit	**Date**	**Variance Limit (mg/l)**	**Current Discharge (mg/l)**	**Flow (mgd)**	**Demand (lbs/day)**	**Seasonal Demand (lbs)***	**Cumulative Demand (lbs)**	**Captial Cost to Upgrade**	**O&M Cost to Upgrade**	**NPV Cost to Upgrade**
1	10/1/2017	1	2.4	3.0600	35.73	3,216	3,216	$980,168	$9,189	$1,113,162
2	10/1/2022	0.8	2.4	3.1212	41.65	533	3,748	$1,360,233	$15,643	$1,586,630
3	10/1/2027	0.5	2.4	3.1836	50.45	792	4,540	$1,647,582	$18,947	$1,921,806
4	10/1/2032	0.3	2.4	3.2473	56.87	578	5,119	$2,136,046	$28,326	$2,546,008
*Incremental Demand / Assuming season is 90 days										

DEER LODGE									Demand Calculations
Oxidation Ditch with MLE process (under construction)									
Total Nitrogen									
							NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)**	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	3/1/2018	10	6	1.27	-42.37	0	0	$0	$0	$0
2	3/1/2023	8	6	1.30	-21.61	0	0	$0	$0	$0
3	3/1/2028	8	6	1.32	-22.04	0	0	$0	$0	$0
4	3/1/2033	6	6	1.35	0.00	0	0	$0	$0	$0
*Incremental Demand / Assuming season is 90 days										
**Discharge concentration after construction will be similar to current discharge because of significant I&I reduction projec										
Total Phosphorous										
							NPV Costs based on 20 Years at 3.3%			
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)**	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	3/1/2018	1	1	1.27	0.00	0	0	$0	$0	$0
2	3/1/2023	0.8	1	1.30	2.16	194	194	$11,291	$256	$14,993
3	3/1/2028	0.5	1	1.32	5.51	301	496	$28,792	$652	$38,233
4	3/1/2033	0.3	1	1.35	7.87	212	708	$41,114	$931	$54,596
*Incremental Demand / Assuming season is 90 days										
**Discharge concentration after construction will be similar to current disharge because of significant I&I reduction projec										

ROCKER										Demand Calculations
Activated Sludge Package Plant with Aerated Lagoon Polish										
Total Nitrogen										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	6/1/2018	15	18.1	0.022	0.57	77	77	$77,612	$699	$87,721
2	6/1/2023	12	18.1	0.022	1.14	77	154	$154,392	$1,390	$174,503
3	6/1/2028	10	18.1	0.023	1.55	55	209	$207,258	$1,865	$234,255
4	6/1/2033	8	18.1	0.023	1.97	57	265	$344,866	$3,919	$401,586
*Incremental Demand / Assuming season is 90 days										
Total Phosphorous										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	6/1/2018	2	10.8	0.022	1.61	145	145	$44,295	$415	$50,305
2	6/1/2023	2	10.8	0.022	1.65	3	148	$45,181	$424	$51,311
3	6/1/2028	1	10.8	0.023	1.87	20	168	$51,322	$481	$58,285
4	6/1/2033	0.8	10.8	0.023	1.95	7	175	$63,591	$731	$74,175
*Incremental Demand / Assuming season is 90 days										

YELLOWSTONE ENERGY LIMITED PARTNERSHIP FACILITY										Demand Calculations
Settling Pond with pH Adjustment										
Total Nitrogen										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	5/1/2019	15	NA	0.120		0	0	$0	$0	$0
2	5/1/2024	12	NA	0.122		0	0	$0	$0	$0
3	5/1/2029	10	NA	0.125		0	0	$0	$0	$0
4	5/1/2034	8	NA	0.127		0	0	$0	$0	$0
*Incremental Demand / Assuming season is 90 days										
Total Phosphorous										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	5/1/2019	2	7	0.120	5.00	450	450	$137,278	$1,287	$155,905
2	5/1/2024	2	7	0.122	5.10	9	459	$140,024	$1,313	$159,023
3	5/1/2029	1	7	0.125	6.25	103	562	$171,389	$1,607	$194,644
4	5/1/2034	0.8	7	0.127	6.58	30	593	$215,053	$2,473	$250,846
*Incremental Demand / Assuming season is 90 days										

LOLO										Demand Calculations
Activated Sludge Plant										
Total Nitrogen										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	9/1/2019	15	25	0.21	18	2,398	2,398	$872,653	$7,854	$986,323
2	9/1/2024	12	25	0.22	24	782	3,180	$1,146,872	$10,322	$1,296,261
3	9/1/2029	10	25	0.22	28	563	3,743	$1,337,806	$12,040	$1,512,065
4	9/1/2034	8	25	0.23	32	584	4,326	$2,023,274	$22,992	$2,356,036
*Incremental Demand / Assuming season is 90 days										
Total Phosphorous										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	9/1/2019	2	4.4	0.21	4	384	384	$116,961	$1,097	$132,831
2	9/1/2024	2	4.4	0.22	4	8	391	$119,300	$1,118	$135,488
3	9/1/2029	1	4.4	0.22	6	174	566	$172,389	$1,616	$195,780
4	9/1/2034	0.8	4.4	0.23	7	45	611	$221,643	$2,549	$258,533
*Incremental Demand / Assuming season is 90 days										

BILLINGS										Demand Calculations
Primary Treatment plus A2O Secondary Treatment (under construction) - upgradable to 5-stage when needed										
Total Nitrogen										
								NPV Costs based on 20 Years at 3.3%		
Permit	**Date**	**Variance Limit (mg/l)**	**Current Discharge (mg/l)****	**Flow (mgd)**	**Demand (lbs/day)**	**Seasonal Demand (lbs)***	**Cumulative Demand (lbs)**	**Captial Cost to Upgrade**	**O&M Cost to Upgrade**	**NPV Cost to Upgrade**
1	11/1/2019	10	8	15.10	-252	0	0	$0	$0	$0
2	11/1/2024	8	8	15.40	0	0	0	$0	$0	$0
3	11/1/2029	8	8	15.71	0	0	0	$0	$0	$0
4	11/1/2034	6	8	16.02	267	36,083	36,083	$751,537	$18,788	$1,023,464
*Incremental Demand / Assuming season is 90 days										
**TN Discharge based on recent upgrade design instead of historical DMR datε										
Total Phosphorous										
								NPV Costs based on 20 Years at 3.3%		
Permit	**Date**	**Variance Limit (mg/l)**	**Current Discharge (mg/l)****	**Flow (mgd)**	**Demand (lbs/day)**	**Seasonal Demand (lbs)***	**Cumulative Demand (lbs)**	**Captial Cost to Upgrade**	**O&M Cost to Upgrade**	**NPV Cost to Upgrade**
1	11/1/2019	1	0.5	15.10	-63	0	0	$0	$0	$0
2	11/1/2024	0.8	0.5	15.40	-39	0	0	$0	$0	$0
3	11/1/2029	0.5	0.5	15.71	0	0	0	$0	$0	$0
4	11/1/2034	0.3	0.5	16.02	27	2,406	2,406	$270,608	$6,438	$363,784
*Incremental Demand / Assuming season is 90 days										
**TP Discharge based on recent upgrade design instead of historical DMR datε										

ABSARROKEE										Demand Calculations
Three Cell Aerated Lagoon										
Total Nitrogen										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	2/1/2020	15	14.8	0.26	0	0	0	$0	$0	$0
2	2/1/2025	12	14.8	0.26	6	823	823	$273,308	$2,460	$308,909
3	2/1/2030	10	14.8	0.27	11	616	1,439	$473,660	$4,263	$535,357
4	2/1/2035	8	14.8	0.27	15	641	2,080	$895,443	$10,175	$1,042,714
*Incremental Demand / Assuming season is 90 days										
Total Phosphorous										
								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	2/1/2020	2	1.8	0.26	0	0	0	$0	$0	$0
2	2/1/2025	2	1.8	0.26	0	0	0	$0	$0	$0
3	2/1/2030	1	1.8	0.27	2	160	160	$48,751	$457	$55,365
4	2/1/2035	0.8	1.8	0.27	2	44	204	$73,997	$851	$86,313
*Incremental Demand / Assuming season is 90 days										

RED LODGE — **Demand Calculations**

Enhanced 3-Cell Aerated Lagoon

Total Nitrogen

								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	7/1/2020	15	14.5	0.59	-2	0	0	$0	$0	$0
2	7/1/2025	12	14.5	0.60	13	1,694	1,694	$386,253	$3,476	$436,565
3	7/1/2030	10	14.5	0.61	23	1,416	3,110	$702,869	$6,326	$794,423
4	7/1/2035	8	14.5	0.63	34	1,472	4,582	$1,354,812	$15,396	$1,577,634

*Incremental Demand / Assuming season is 90 days

Total Phosphorous

								NPV Costs based on 20 Years at 3.3%		
Permit	Date	Variance Limit (mg/l)	Current Discharge (mg/l)	Flow (mgd)	Demand (lbs/day)	Seasonal Demand (lbs)*	Cumulative Demand (lbs)	Captial Cost to Upgrade	O&M Cost to Upgrade	NPV Cost to Upgrade
1	7/1/2020	2	2.2	0.59	1	89	89	$26,998	$253	$30,661
2	7/1/2025	2	2.2	0.60	1	2	90	$27,538	$258	$31,275
3	7/1/2030	1	2.2	0.61	6	463	553	$168,533	$1,580	$191,400
4	7/1/2035	0.8	2.2	0.63	7	105	658	$238,755	$2,746	$278,493

*Incremental Demand / Assuming season is 90 days